LAGOMARSINO

SERVICE MANUAL FOR ELECTRIC ADDING MACHINES

TOTALIA

mod. 8341 - 8441 - 8641

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Organizzazione Industriale Lagomarsino - mod. 203 - 1000/B - 5/59

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mod. 8341

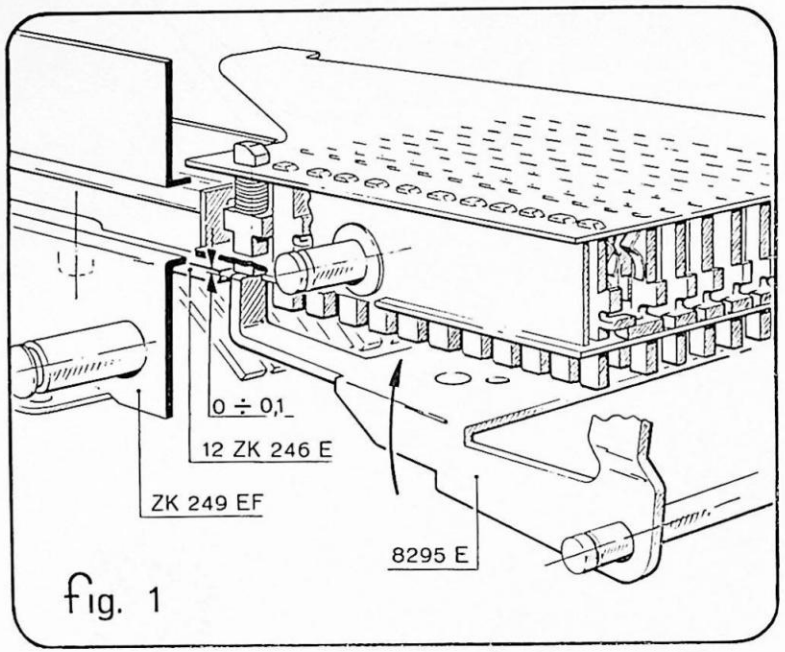


fig. 1

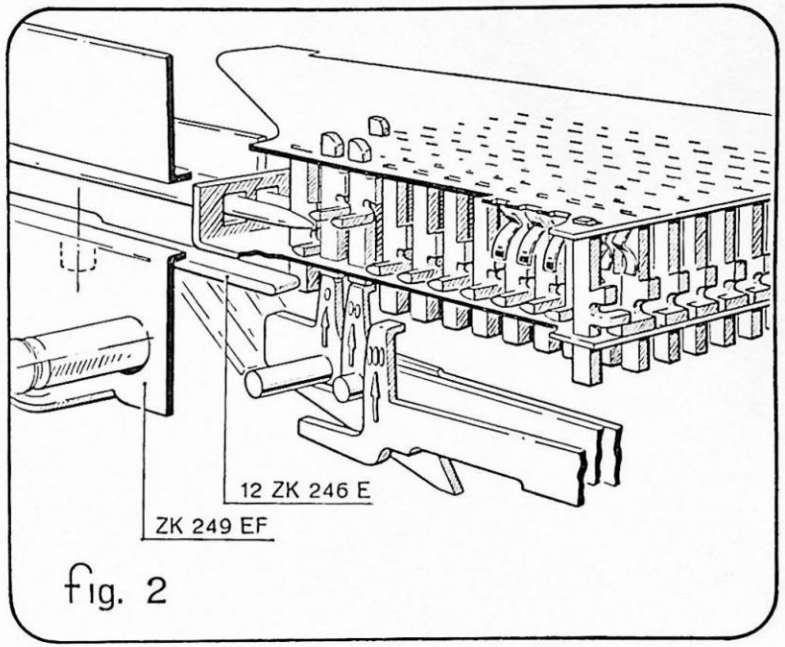


fig. 2

NORMAL OPERATIVE CYCLES

ENTRY OF A NUMBER

Whenever a numeral key is depressed, a corresponding digit is entered in the keyboard. The function takes place as follows:

1) **Half escapement and extraction of the pins.** When depressing any key from 1 to 8, this actuates the relative setting lever B 228 E, which lifts the pin corresponding to the digit entered. At the same time, lever B 228 E accompanies escapement bracket 8295 E in its rotation, which by the top line of its setting tooth (that must not surpass the level of bridge 12 ZK 246 E of the keyboard frame unit ZK 249 EF lifts the first pin of the escapement series, so that the stop carriage advances about 1/2 step, hitting the 2nd pin against the tooth of the escapement bracket 8295 E.

During this half escapement of the carriage, the concerned pins are held in protruding position by the rods. The series of escapement pins is placed in front of the stop carriage and these pins are independent from the numeral pins (fig. 1).

By depressing key 9, the whole above described cycle is performed, but for the extraction of the numeral pins, since they are replaced by the rod supporting square piece 12 Z 254 E assembled between the side frame plates of the machine. If we try to depress any of the 0 - 00 or 000 keys before entering any significant digit, said keys will not sink because two locking devices prevent them from doing so. One locking is produced by the first fixed pin of the zero line, the other consists of the safety given by the locking slider Z 240 3/4 E, which carries three teeth checking the run of the 0 - 00 and 000 ciphers stems when the stop carriage is restored to zero.

It is thus necessary to enter first a significant digit to allow depressing of the 0 - 00 or 000 key. The maximum clearance allowed between the keystems and the three teeth of the keystems and the three teeth of the locking slider Z 240 ¾ is 0.2 mm.

After the first step of the stop carriage, the entry of one 0 is made in the way as for the other digits, whereas for 00 and 000 the stop carriage advances respectively 2 or 3 steps for the extraction of 2 and 3 pins (fig. 2).

2) **Completion of escapement.** When the numeral key has been left free, the escapement bracket 8295 E returns to its resting position and the carriage completes its advance leaning with the pin successive to the actuated pin against bridge 12 ZK 246 E.

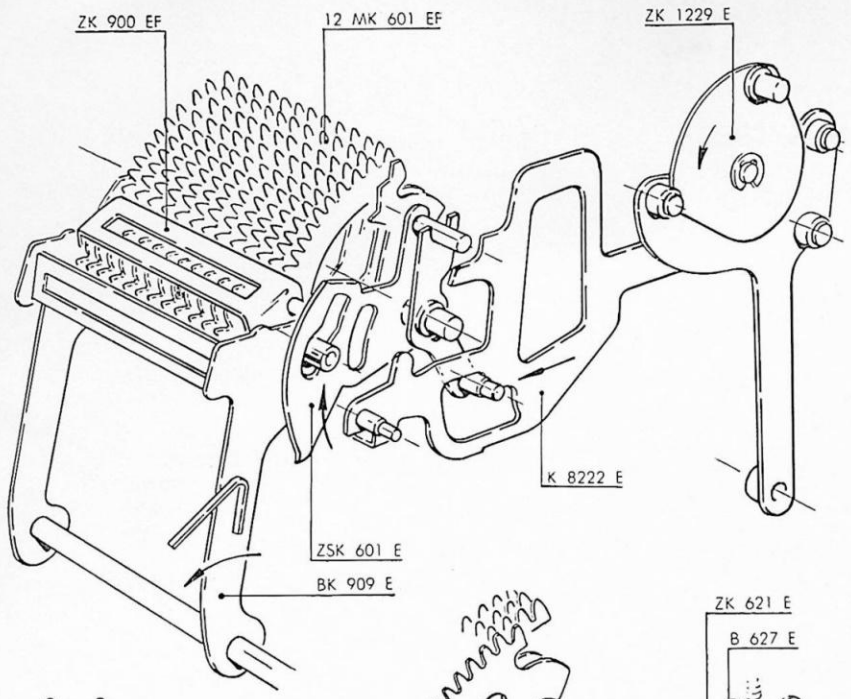


fig. 3

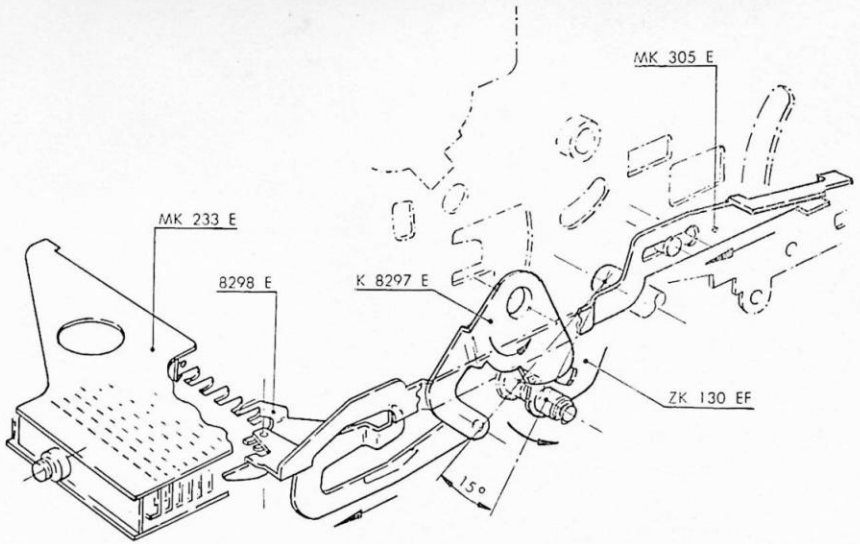


fig. 4

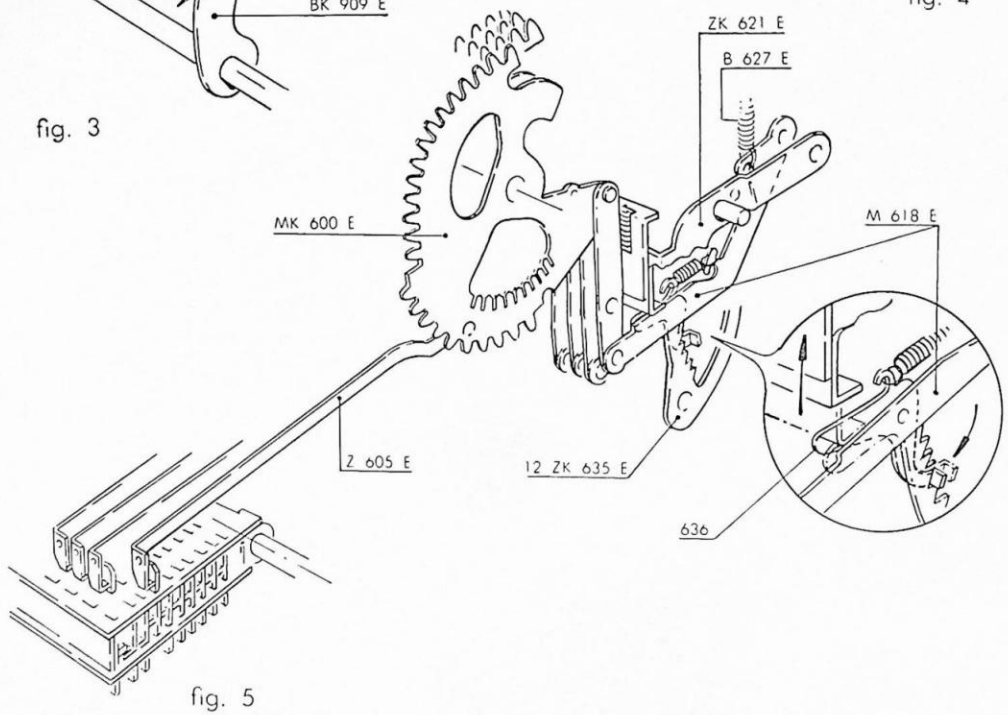


fig. 5

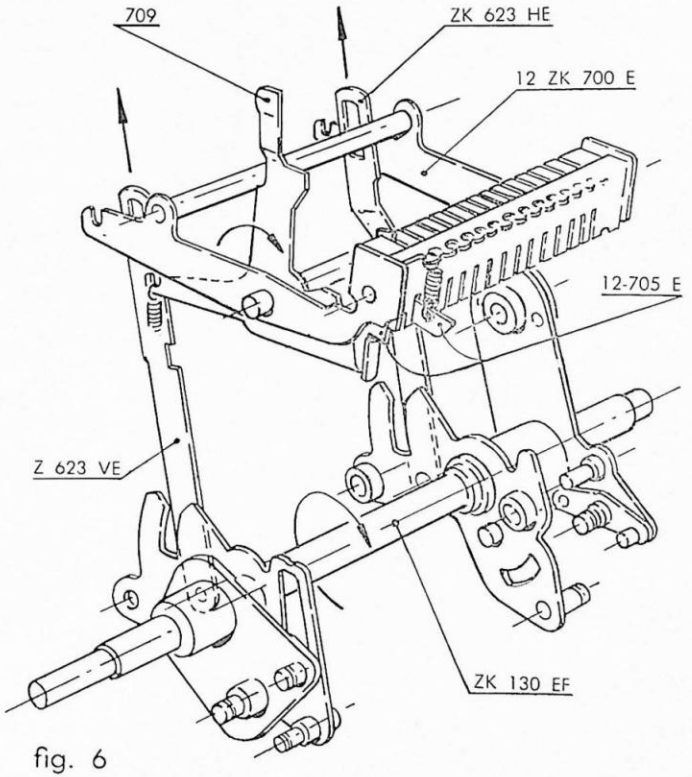


fig. 6

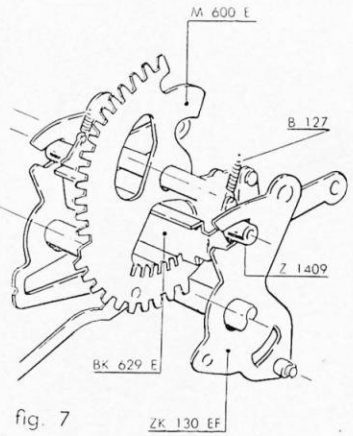


fig. 7

TRANSFER OF THE NUMBER TO THE MACHINE

FORWARD PHASE

3) **Disengaging the totalizer from he sectors.** At every entry of a digit in the keyboard, the stop carriage is pre-set in such way as to allow units MK 600 E to move. Depressing of a control key starts the motor of the machine and cam ZK 1229 E begins its rotation. This moves latch K 8222 E and actuates cams ZSK 601 E, which disengage the totalizer ZK 900 EF from the sector units 2 MK 601 EF (fig. 3).

4) **Locking of the numeral keys and the stop carriage.** At the same time with operation (3), locking lever MK 305 E springs forward and with its lug locks escapement bracket 8295 E. Moreover it actuates lever 8207 E, which pushes lock B 294 ½ E that engages in the lugs of the setting levers of series 228 E.
As a consequence all numeral keys remain locked. With some delay, i.e. after about 15° from the beginning of the rotation of the main shaft ZK 130 EF, the lever 8298 E controlled by said shaft through cam K 8297 E advances to localize and lock the stop carriage MK 233 E in its teeth (fig. 4).

5) **Disengaging the digit bars.** After a rotation of about 20°, the main shaft ZK 130 EF begins to rotate, through cams ZK 622 HE and ZK 622 VE, rake ZK 621 E (if this is disengaged from the locking device ZK 3254 E, i.e. during the operations of +, —, x, NON-ADD). This will allow the sectors MK 600 E drawn by their springs B 627 E to rotate and lift the printing bars. In their motion the sectors always remain with arm M 618 E beside the rake until the selecting tie rods Z 605 E lean against the set pin of the stop carriage and stops, whereas the rake still moves on to allow the anti-bounce ratchet 636 to engage in the anti-bounce sector assembly. 12 ZK 635 E (fig. 5).

6) **Loading of the printing hammers.** Every sector MK 600 E rotates according to the digit entered and makes free the corresponding hook 12-705 E. On account of the rotation of shaft ZK 130 EF, by means of the two connecting rods ZK 623 HE and Z 623 VE, the frame 12 ZK 700 E carrying hooks 12-705 E is pushed so that the hooks themselves hook on to the corresponding hammers 709 and load and prepare them for the printing cycle (fig. 6).

7) **Controlling the engagement of the stop knife.** Almost at the end of the forward cycle of shaft ZK 130 EF, this controls the engagement of the stop knife BK 629 E in the inner teeth of the sectors M 600 E and aligns them (fig. 7).

8) **Restoring of the tens transfers.** After operation (3), the gear wheels of the totalizer that have disengaged from the toothed sectors, get in mesh with the teeth of the tens transfers.

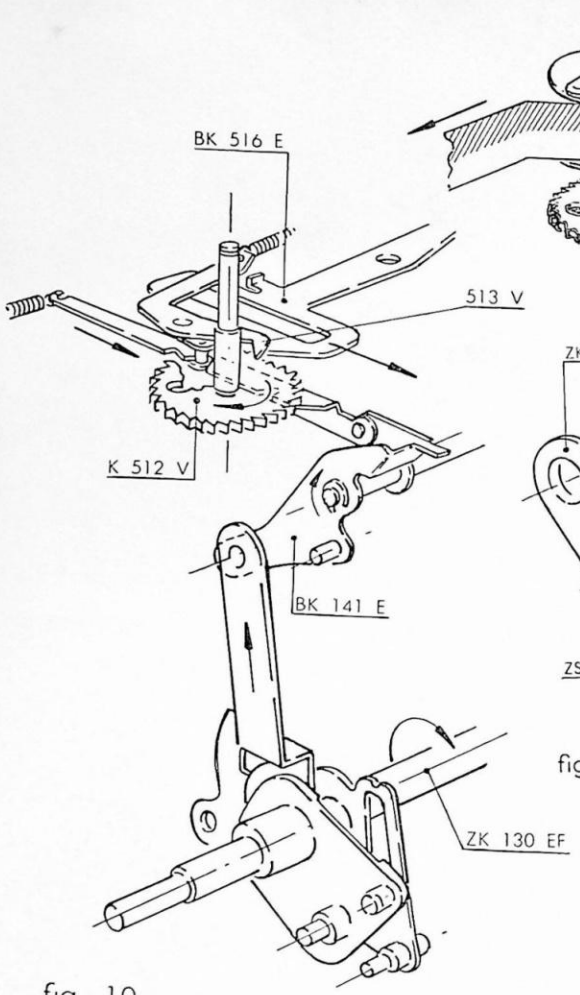


fig. 10

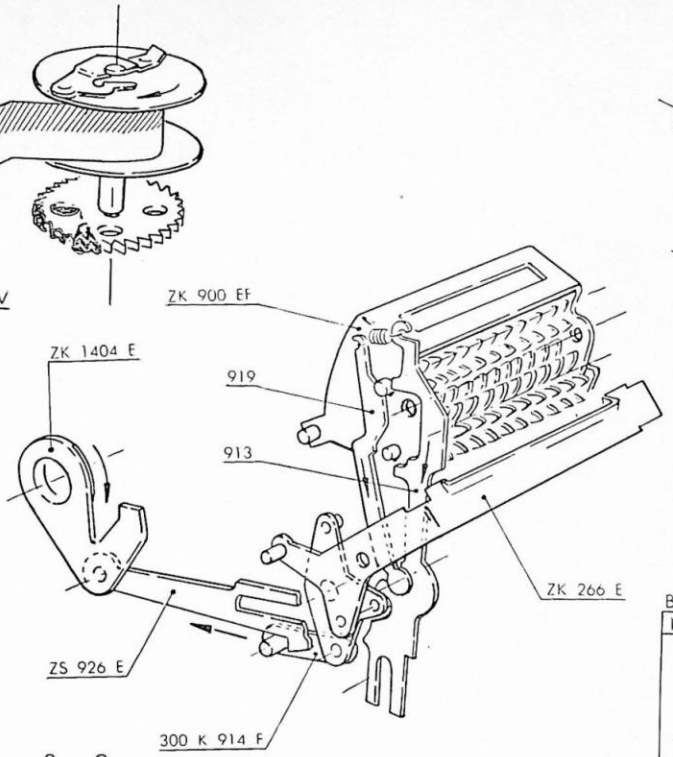


fig. 9

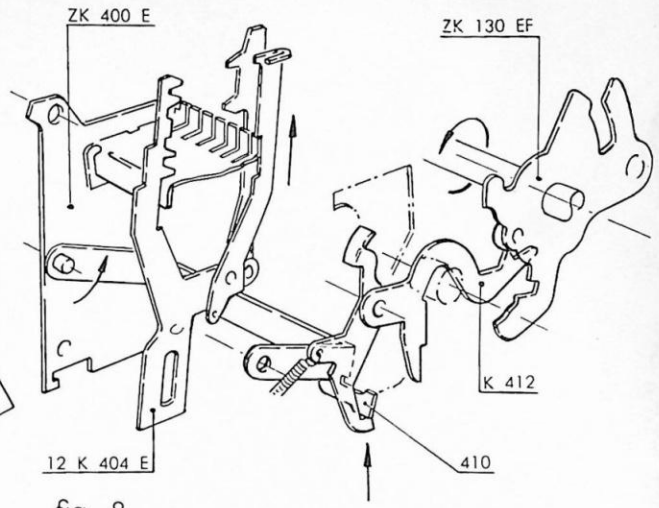


fig. 8

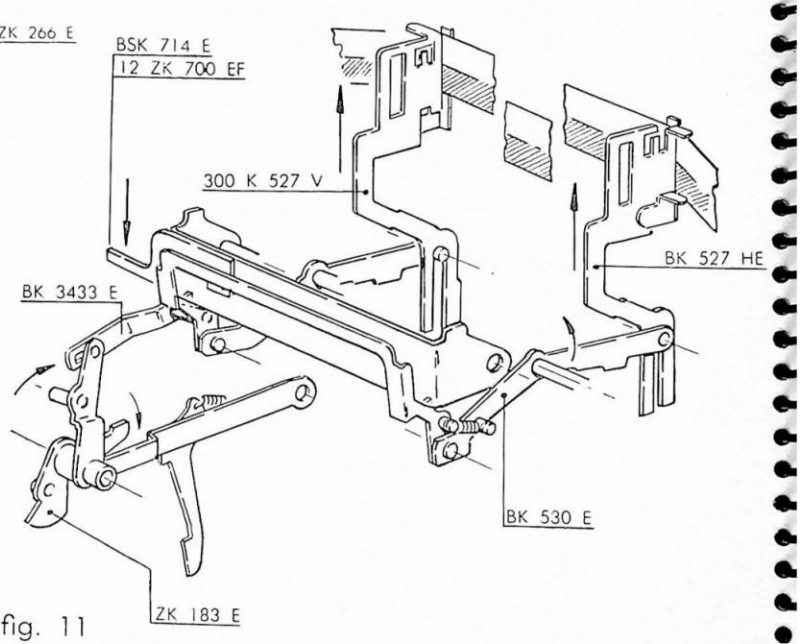


fig. 11

By rotating, assembly ZK 130 EF controls the ratchet lever assembly K 412, which, engages and lifts the tens transfer returning lever 410. This returns the tens transfers, that might have fallen on account of one or more complete revolutions of the totalizer gear wheels, hooking them on to the cross piece on assembly ZK 400 E (fig. 8).

In this motion, the returned tens transfers produce the rotation of one tooth of the corresponding pinion of the totalizer, bringing it from position 0 to position 1, which means one tenth in the calculation.

9) **Totalizer reverse link actuation.** By rotating, main shaft ZK 130 EF draws shift slide driver ZS 926 E that glides with its slot on the stud of the subtraction control frame ZK 266 E. According to the position taken by said frame, the slide driver hooks on in its run the rocker arm 300 K 914 F, which, by rotating in one direction or in the opposite one, lifts or lowers the unit consisting of levers 913 and 919, which draws and locates the totalizer in the positions of positive or negative (fig. 9).

10) **Controlling the ribbon motion.** During the whole forward phase, the main shaft ZK 130 EF controls with its connecting rod the assembly BK 141 E, which, by means of its ribbon feed dog, draws the rocker arm BK 516 E carrying the ratchets 513 H and 513 V.

During this motion, one of the ratchet engages with the corresponding toothed wheel carrying the ribbon spool and rotates it by a fraction of a turn. When completely wound up on either spool, the ribbon goes into tension, which reverse the position of the rocker arm BK 516 E, reversing at the same time the direction in which the ribbon winds up (fig. 10).

11) **Controlling the printing in red (negative).** During a subtraction or a negative balance, at the beginning of the forward cycle assembly ZK 183 E frees arm BK 3433 E, which pushes the ribbon lifting bridge BK 530 E under the hammer releasing control frame 12 ZK 700 EF.

This presses on the ribbon lifting bridge during the loading of the hammers and lifts the ribbon guides BK 527 HE - 300 K 527 V holding them until printing is completed, which thus will be in red (fig. 11).

12) **Printing of the number and of the points set.** At the end of operation (6), i.e. when the hammers are loaded and held back by the hooks, assembly BK 141 E goes on in its motion and by its tongue controls the hammer disengagement assembly BSK 714 E until it produces the disengagement of the hooks 12-705 E from the hammers, which shoot and push the digit and sign bars that print on the paper tape.

Whereas for the ciphers that are on the left of the first significant digit, printing does not occur, the ciphers on the right are being printed because the hammers 709 are connected by lugs, so that the left hammer, which loads upon being actuated draws the right hammer, that might not be actuated because a cipher has been entered. In this case after the first significant digit all other digits should be ciphers, all hammers are chain-loaded by the motion of the first one.

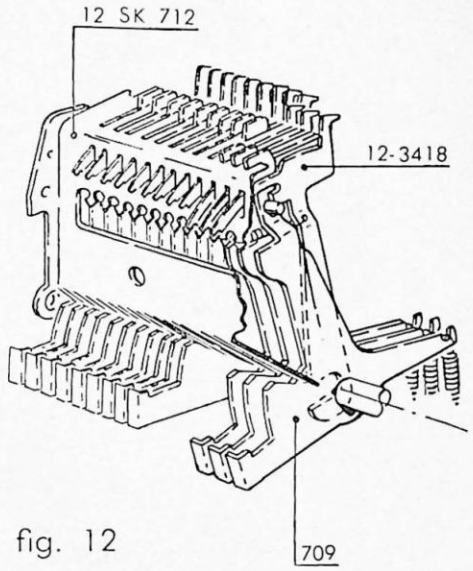


fig. 12

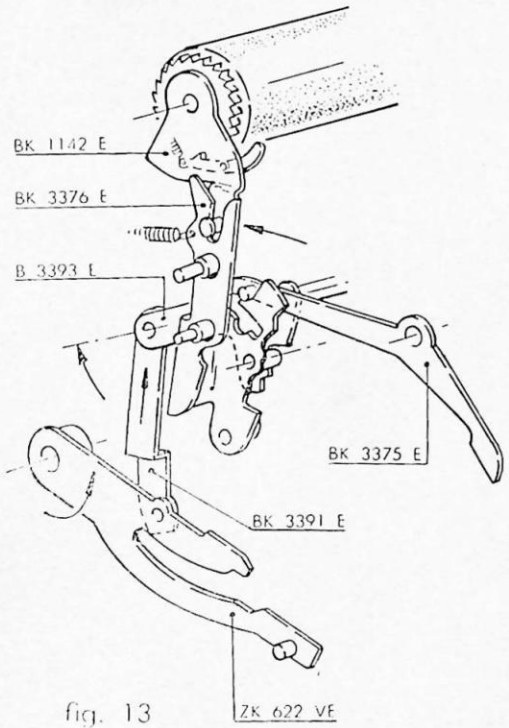


fig. 13

At the same time with the printing of the digits and according to how the visible spacing has been pre-set by means of the controlling knob, the printing of the points takes place through the point bars 12-3418 controlled by hammers 709 (fig. 12).

13) **Pre-setting for the clearance of the number entered.** During the whole forward phase, main shaft ZK 130 EF draws cancelling lever Z 261 EF connected with assembly BK 282 E and brings the selector control lever BK 284 E into such a position as to allow it to hook on to roller 288 of stop carriage returning lever ZK 287 E.

14) **Pre-setting for the spacing of the paper.** With the movement of cams ZK 622 HE and VE, through connecting rod BK 3391 E and intermediate lever B 3393 E, the lever assembly BK 3376 E is made free and has the possibility of taking two stop positions:

Pre-setting for the rotation of the rubber platen of 1 step or of 2 steps (Total).

During this movement, lever assembly BK 3376 E draws in neutral ratchet BK 1142 E, which, at the end of the run hooks on to the toothed wheel of the rubber platen and is ready for return in the return phase (fig. 13).

RETURN PHASE

15) **Meshing in control of the totalizer.** As the return phase begins, the cam assembly ZK 1229 E goes on in its rotation and draws latch K 8222 E. This hooks on with its tooth cam assembly ZSK 601 E, which, by rotation, controls the meshing in of the totalizer ZK 900 EF with the sectors assembly 12 MK 601 EF.

16) **Disengagement control of the stop knife.** Immediately upon the meshing in of the totalizer, assembly ZK 130 EF disengages by rotation stop knife BK 629 E, which, being returned by its springs, comes out of the locating teeth of the sectors MK 600 E leaving them free.

17) **Disengagement of the anti-bounce ratchets and start of the restoring to zero of the bars.** After operation (16), the rake ZK 621 E begins its return phase, i.e. it lowers, thereby disengaging the anti-bounce ratchets 636 from the toothed sectors and successively by pressing on arms M 618 it returns units MK 600 E freed, bringing them back to the zero position.

18) **Transfer of the number to the totalizer and fall of the tens transfers.** The return to zero of units MK 600 E rotates the corresponding pinions ZK 900 EF of the totalizer of so many teeth as the digits of the number entered.

If a pinion, on account of the storage of successive digits, should rotate beyond its capacity with its excess capacity tooth it makes the tens transfer of the next pinion to the left fall.

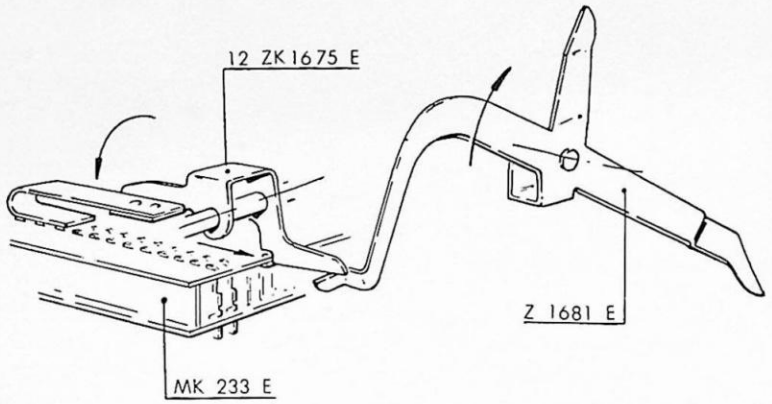


fig. 14

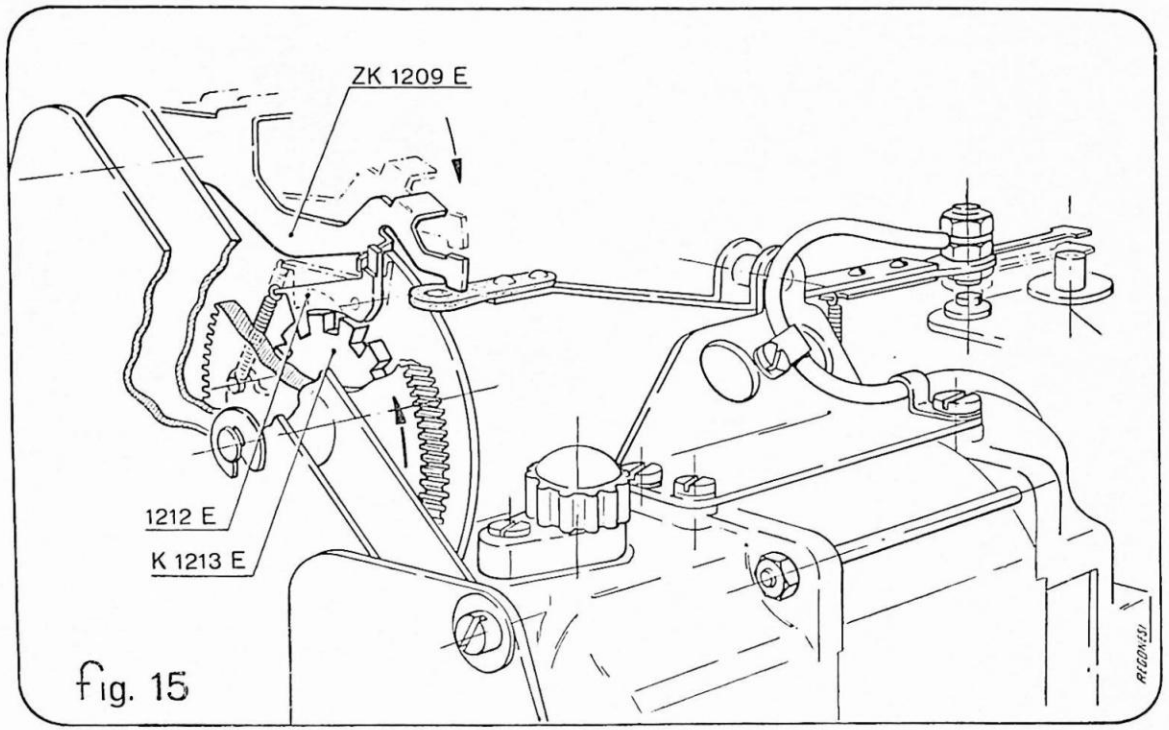


fig. 15

19) **Unlocking of the keyboard.** Upon the restoring to zero of assemblies MK 600 E, locking lever MK 305 E, actuated by returning linkg ZK 1644 E, is taken out from the rack of the stop carriage, leaving it free for clearance.

20) **Clearance control.** The stop carriage being unlocked, clearance lever Z 261 EF connected with unit BK 282 E draws in the return phase assembly BK 284 E. This is engaged with roller 288 of assembly ZK 287 E and returns the stop carriage to its resting position. At the end of this operation, assembly BK 284 E must disengage from roller 288. We have here an adjustment with an eccentric that facilitates said unlocking function.

At the end of the clearance run of the stop carriage, plate 12 Z 241 E will have returned to zero all the pins set of the lines 1 2 3 4 5 6 7 8 and part of line 0.

The remaining pins of the 0 line are restored to zero by the elastic lug of assembly 12 ZK 1675 E rotating on its shaft.

This action is performed upon them by the stop carriage in the remaining part of the run beyond its resting position.

Moreover, assembly 12 ZK 1675 E accomplishes a rotation, in the middle of the machine cycle, which is actuated by lever Z 1681 E to give a greater safety to the position of the pins of the 0 line that have not been set (fig. 14).

21) **Paper spacing control.** About in the middle of the return phase, lever assembly BK 3376 E is returned from one of the catch positions to the resting position.

During this movement, by means of its fork, lever BK 3376 E returns pawl BK 1142 E — which is engaged with the toothed wheel of the rubber platen — and rotates it one or two spaces according to the pre-setting in the forward phase.

22) **Motor stop.** At the end of the return phase, the main shaft ZK 130 EF engages with its milled gudgeon the lever assembly ZK 1209 E. This actuales as a first by means of its back arm, which lowers, the disconnection of the motor and then checks the pawl 1212 E that disengages from the toothed wheel K 1213 E and puts the motor in neutral (fig. 15).

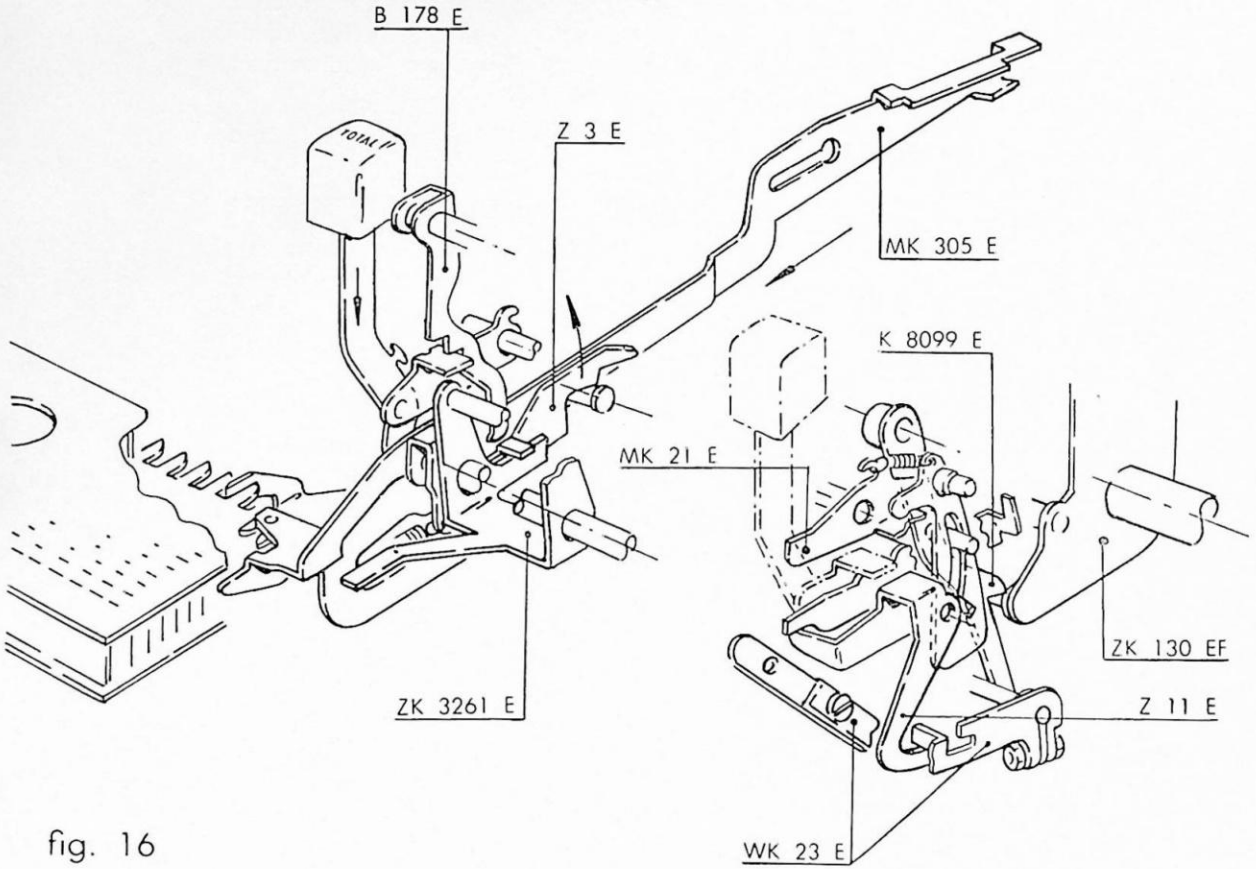

B 178 E
Z 3 E
MK 305 E
K 8099 E
MK 21 E
ZK 130 EF
ZK 3261 E
Z 11 E
WK 23 E

fig. 16

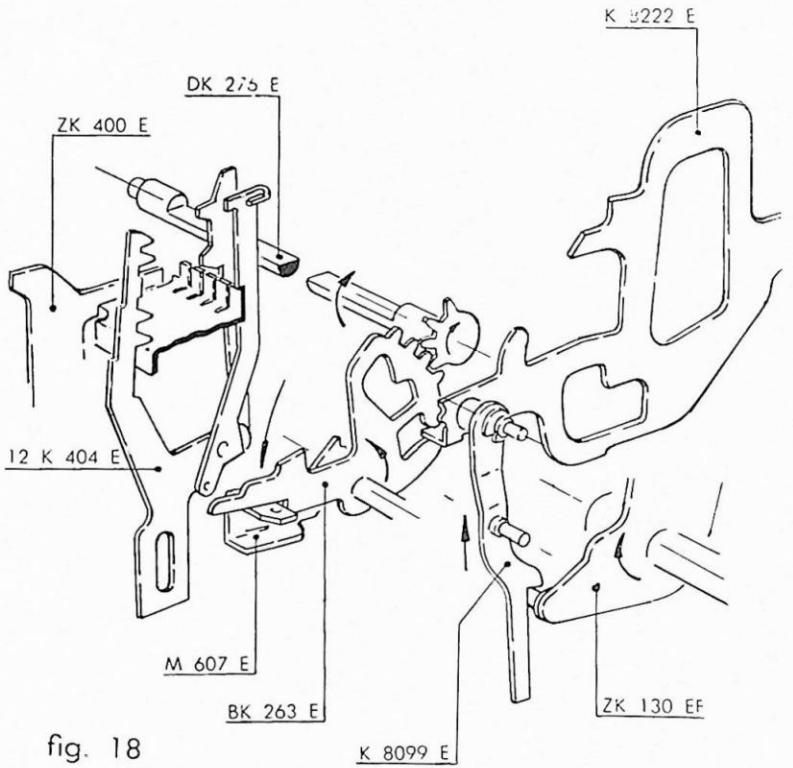

K 8222 E
DK 275 E
ZK 400 E
12 K 404 E
M 607 E
BK 263 E
K 8099 E
ZK 130 EF

fig. 18

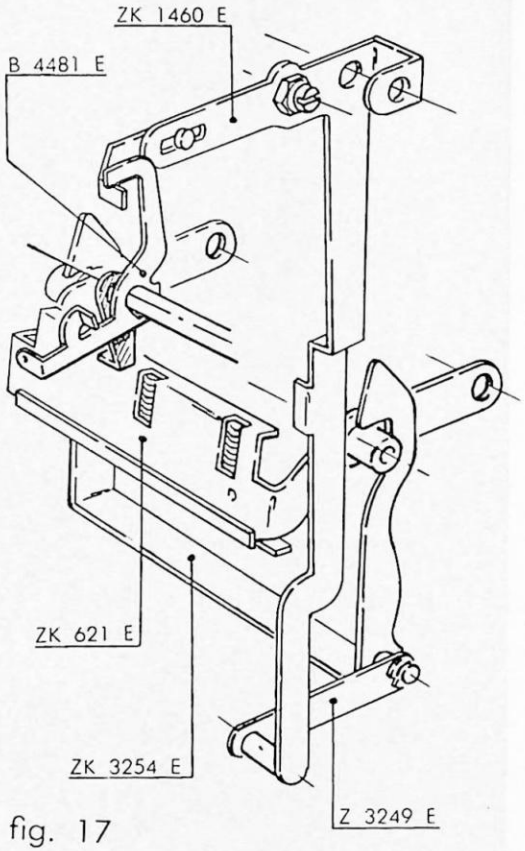


fig. 17

ADDITION WITH TOTAL - Succession of phases

At every entry of a number in the keyboard and by depressing the + key, and after the transfer to the machine and printing of the value on the tape, the plus item transfers to the totalizer ZK 900 EF. On account of the accumulation of more plus items, which add up, the fall of tens transfers can occur and these will be restored in the forward phase of a complete successive cycle. Said restoring adds up one unit to the next pinion on the left.

Upon completing the entering operations, the machine will be in the following conditions:

— machine in resting position with the plus items printed in column on the paper tape

— totalizer storing the value of the plus items added, under exclusion of the tens transfers that might have been actuated by the last plus item entered.

Operations performed (1) - (2) - (3) - (4) - (5) - (6) - (7) - (8) - (10) - (12) - (13) - (14) - (15) - (16) - (17) - (18) - (19) - (20) - (21) - (22)

CONTROL OF TOTAL KEY

23) **First Cycle.** By depressing the total key, rod K 8099 E gets nearer to the cam of the main shaft ZK 130 EF by means of assembly MK 21 E. It actuates hook Z 11 E to lock the + key and by disengaging hook B 138 E draws bridge assembly ZK 3261 E and catch Z 3 E, which, disengages locking lever MK 305 E that performs operation (4) (fig. 16).

Oper. (3) disengaging the totalizer, oper. (8) restoring of the tens transfers, oper. (15) meshing in control of the totalizer, follow with the values of the tens transfers that might have been restored.

24) **Locking of rake assembly.** At the beginning of this first cycle, lock B 4481 E holds back assembly ZK 1460 E connected to calculation locking bridge assembly ZK 1254 E, which, engages rake assembly ZK 621 E, maintaining locked sectors MK 600 E (fig. 17).

25) **Tens transfers locking.** Almost at the end of the return phase, the stud on the cam of assembly ZK 130 EF engages rod K 8099 E and, together with part K 8222 E, lifts it, thereby rotating assembly BK 263 E.

This assembly disengages and checks with its front part the sign lever, whereas, with its toothed back end it meshes in with the total cam shaft assembly DK 276 E and rotates it so it will present its round part to the contact of the tens transfers that have no more possibility to disengage from the frame ZK 400 E (fig. 18).

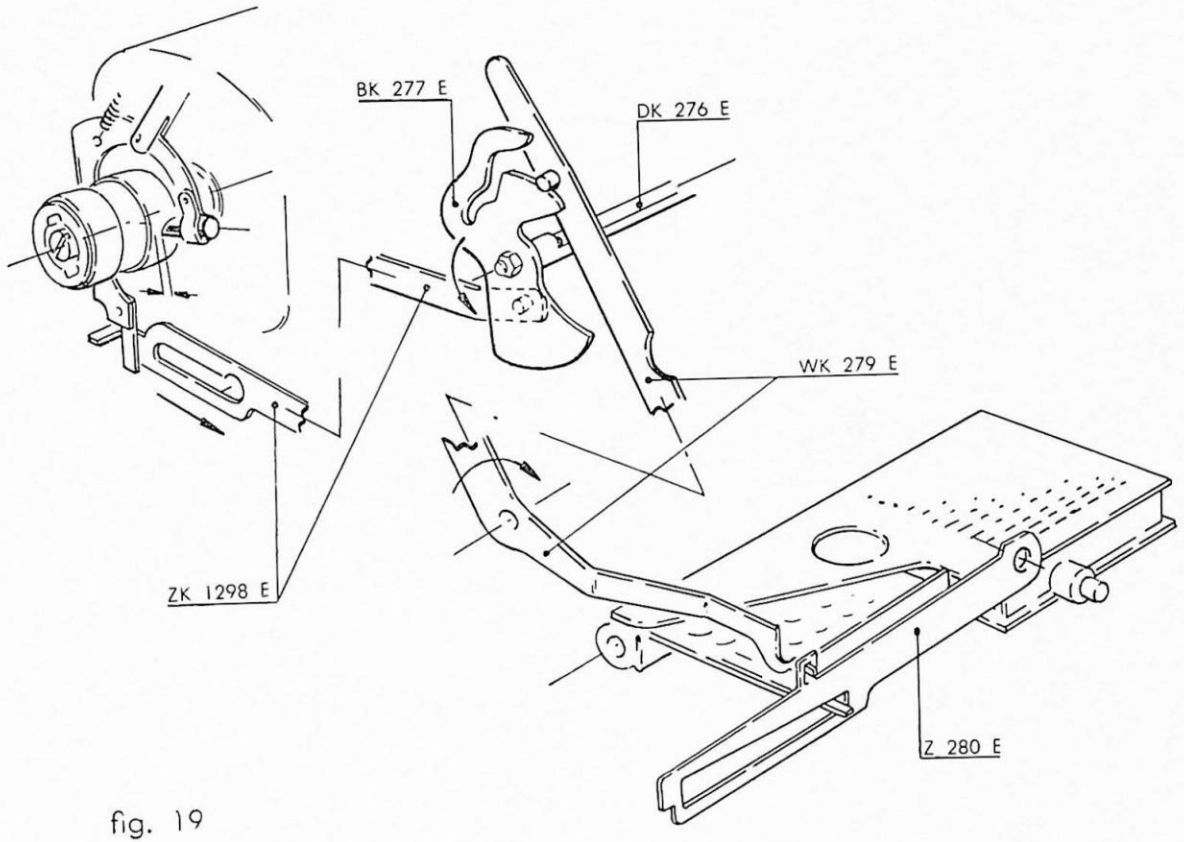


fig. 19

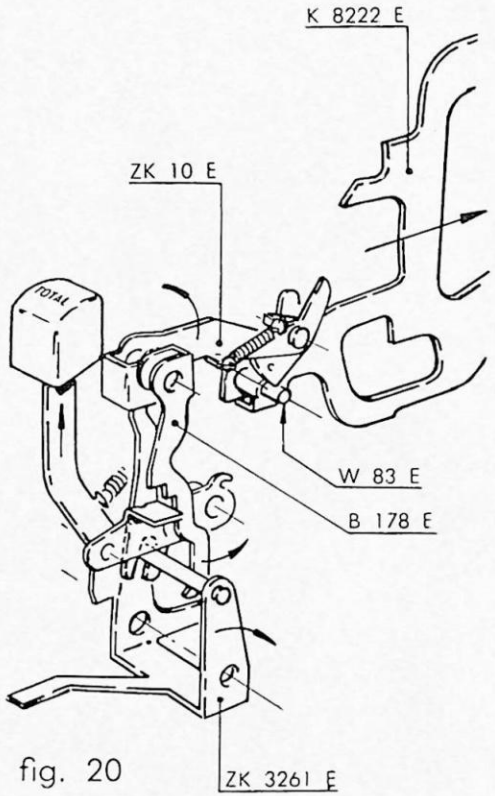


fig. 20

26) **Unlocking of the calculating sectors and slow-down of the machine speed.** Assembled on shaft DK 276 E there is cam BK 277 E, which, in its rotation, actuates rocker arm WK 279 E and lever Z 280 E that exclude the engaging table from the sliders of units MK 600 E that remain free. This same cam BK 277 E produces by rotating, and through the slow-down lever assembly ZK 1298 E and the motor switching devices, a slow-down in the speed of the machine of about 80 revolutions a minute.

This reduction of speed lasts until the end of the cycle (fig. 19).

SECOND CYCLE

27) **Unlocking of the rake assembly and of the digit and sign bars.** At the end of the first cycle, lock B 4481 E has left free assembly ZK 1460 E and in this way oper. (5) is performed.

28) **Totalizer clearance and printing of the total stored.** The pinions of the totalizer — this remained near the disengaged sectors MK 600 E — rotate under the push of said sectors stopping in the zero position with the carry-over tooth against the lever of the tens transfers locked on account of oper (25).

The sectors MK 600 E, with the relating bars, will be in the printing position for the number of the total with its corresponding symbol at side.

At the same time, the following operations take place, namely oper. (6) loading of the printing hammers, oper. (7) controlling of the knife stop and oper. (12) printing of the number, of the symbol and of the points pre-set.

29) **Restoring of the total key.** At the beginning of the return phase, latch assembly K 8222 E held back in uplifted position glides backwards (returned by cam ZK 1229 E) and with stud W 83 E engages the swinging part of assembly ZK 10 E and returns the latter.

This assembly controls by means of its lower part bridge ZK 3261 E, which disengages hook B 178 E allowing the total key to be returned (fig. 20).

30) **Totalizer disengaging control.** At the same with oper. (29), latch assembly K 8222 E engages with pawl 810 the cam assembly ZSK 601 E, which by rotation controls the disengaging of the totalizer restored to zero.

Immediately after oper. (30) totalizer disengaging control, we have oper. (16) disengagement control of the stop knife, which leaves sectors MK 601 E free (these, however, are checked by pawls 720 ½), then oper. (17) disengagement of the anti-bounce pawls and restoring to zero of the bars and finally oper. (22) motor stop.

The addition cycle with total is so completed.

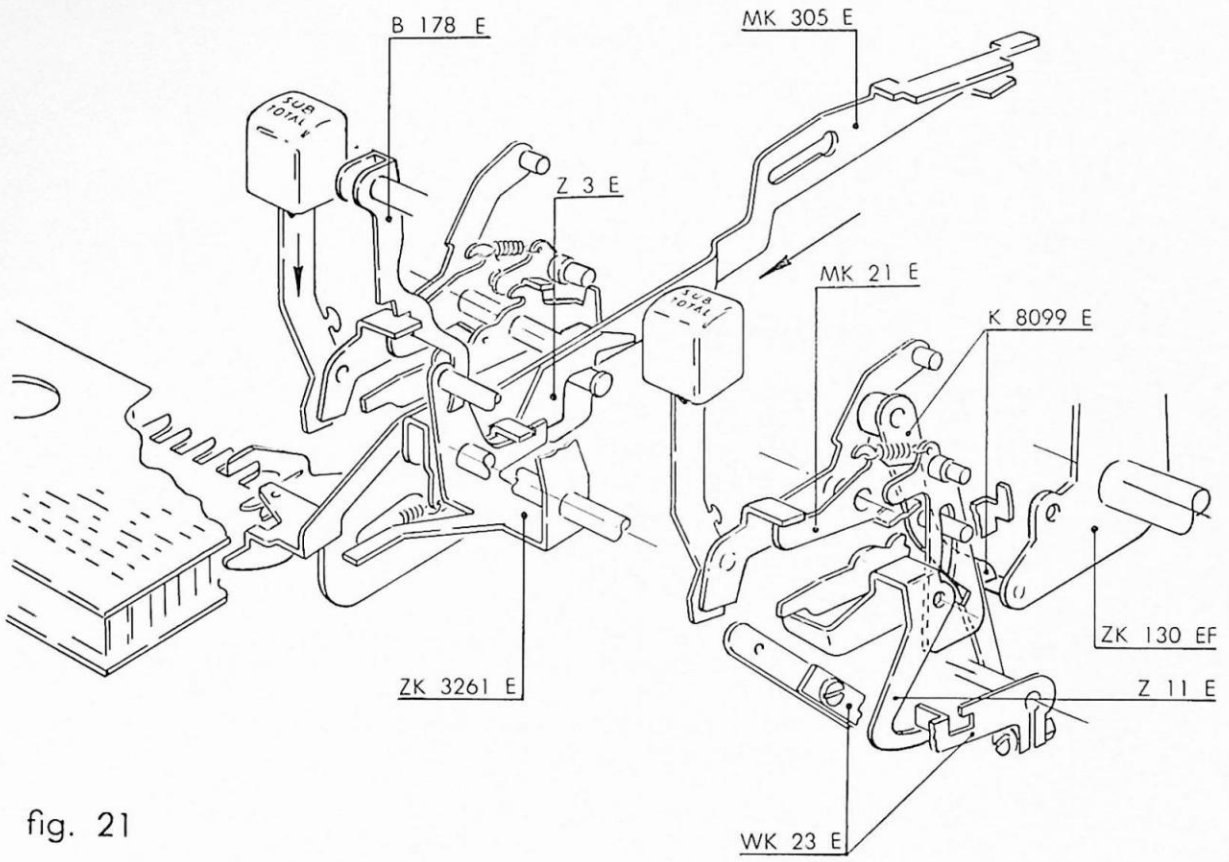


fig. 21

CARRY FORWARD TOTAL OR SUB-TOTAL

This is obtained with a succession of operations similar to those of the TOTAL, but for the difference of the control key of the operation and for the fact that at the end of the second cycle the totalizer is not restored to zero. This occurs exactly as follows:

31) **Control of the sub-total key.** By depressing the sub-total key, the rod K 8099 E gets nearer to the cam of the main shaft ZK 130 EF through assembly MK 21 E and actuates pawl Z 11 E to lock the + key, whereas with its stud acting on the back arm of the lever assembly ZK 4310 E it controls the lever assembly WK 19 E. This lowers and places its lug in such a way as to check action of the pawl 810 assembled on the latch assembly K 8222 E.

Moreover, rod K 8099 E disengages pawl B 178 E, which draws bridge unit ZK 3261 E and catch Z 3 E, which in its turn releases locking lever MK 305 E and thus performs oper. (4) (fig. 21).

Then, as for the TOTAL, follow oper. (3) disengaging the totalizer, oper. (8) restoring of the tens transfers, oper. (15) meshing in control of the totalizer with the value of the tens transfers that might have been restored, oper. (27) unlocking of the rake assembly and of the digit and sign bars and oper. (28) totalizer clearance and printing of the total stored.

32) **Returning of sub-total key.** At the beginning of the return phase, latch assembly K 8222 E held back in uplifted position glides backwards (returned by cam ZK 1229 E) and with stud W 83 E engages the swinging part of assembly ZK 10 E and returns the latter.

This assembly controls by means of its lower fork-shaped part bridge ZK 3261 E, which disengages pawl B 178 E allowing the sub-total key to be returned. Now the totalizer does noe get away from the sectors MK 600 E on account of the function of lever assembly WK 19 E.

Successively, we have oper. (16) disengagement control of the stop knife and oper. (17) disengagement of the anti-bounce ratchets and restoring to zero of the bars.

33) **Re-transfer of the total in the totalizer.** During the restoring to zero of the bars in the final return cycle, the sectors MK 600 E that remained with the totalizer ZK 900 EF engaged, retransfer the value of the total to the pinions of the totalizer.

Finally oper. (22) motor stop takes place.

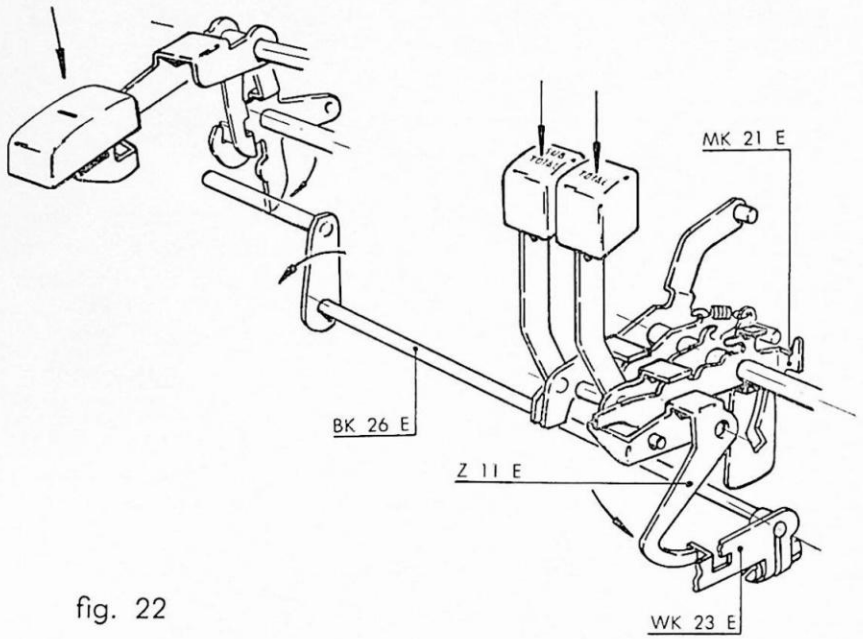

MK 21 E
BK 26 E
Z 11 E
WK 23 E

fig. 22

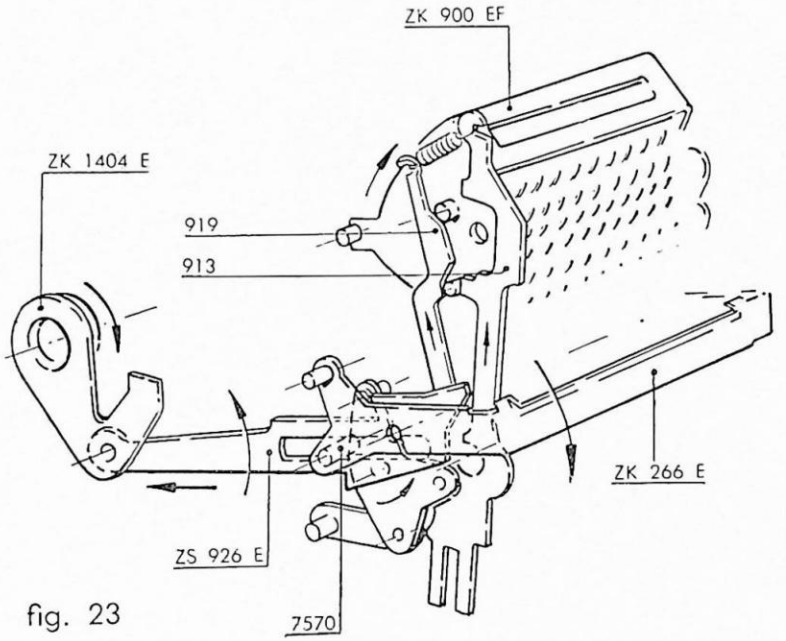

ZK 900 EF
ZK 1404 E
919
913
ZK 266 E
ZS 926 E
7570

fig. 23

SUBTRACTION WITH POSITIVE TOTAL - Succession of phases

This is obtained when the plus item is greater than the minus item.

The entry of the plus item and its transfer in the machine follow the normal addition operative cycles already described.

FORWARD PHASE

34) **Entry of the minus item.** After having entered the number in the keyboard, depress minus key that disengages pawl WK 189 E, which rotates assembly ZK 197 E. This leaves reversing control lever Z 190 E free to lift, which draws the subtraction bridge assembly ZK 266 E, as soon as assembly ZK 183 E has moved under the control of main shaft ZK 130 EF through cam lever ZK 35040 EF.

At the same time, we have oper. (11) controlling the printing in red and successively oper. (3) disengaging the totalizer, oper. (4) locking of numeral keys and stop carriage, oper. (5) disengaging the digit bars, oper. (6) loading of the printing hammers and oper. (7) controlling the engagement of the stop knife.

35) **Locking of the total and sub-total keys.** When depressing the minus key and therefore arm WK 23 E is lowered on the right side of the machine by means of shaft BK 26 E, the TOTAL and SUB-TOTAL keys cannot be depressed, since these control assembly MK 21 E, which, draws bridge Z 11 E and this leans with its nose against the lug of arm WK 23 E (fig. 22).

36) **Disengagement and stopping of the sign bar.** When depressing the (—) key, bridge assembly ZK 266 E disengages in its motion from the step on the righ side frame ZK 1002 HE the lever M 607 E, letting it glide in the slot and stopping it with the front part. In this position sign sector assembly MK 600 ½ E is pre-set for the printing of the sign.

37) **Reverting the totalizer.** In its rotation, subtraction bridge assembly ZK 266 E lifts lever ZS 926 E by means of stud 7570 engaged in the lever slot. Said lever is placed in such a way that during its run actuated by main shaft ZK 130 EF it will perform oper. (9) for the reverse actuation of the totalizer (Fig. 23).

Successively the following operations are performed: oper. (11) and (12) control of red printing, oper. (10) ribbon motion control, oper. (13) pre-setting for clearance of number entered, oper. (14) pre-setting for paper spacing (1 space).

RETURN PHASE

38) **Totalizer engagement control.** At the beginning of the return phase, we have the engagement of the **reversed** totalizer. Oper. (16) stop knife disengagement control and oper. (17) anti-bounce ratchets disengagement and start of bar restoring to zero follow.

39) **Clearance of totalizer and fall of the tens transfers.** The restoring to zero of sectors MK 600 E rotates the corresponding subtraction pinions of the totalizer ZK 900 EF, so as to clear the value of the minus item.
When a pinion stores a digit of the minus item higher than the digit of the plus item, with its excess capacity tooth it causes the fall of the tens transfer of the next pinion on the left.
Then follow oper. (19 unlocking of the keyboard, oper. (20) clearance control and oper. (21) paper spacing control.

40) **Key restoring.** Almost at the end of the return cycle, the roller Z 1396 assembled on the main shaft ZK 130 EF meets and pushes the restoring assembly ZK 175 E, which, through its stud W 910 transfers the motion to bridge 8112 E that rotates ratchet WK 189 E. In this movement, the tooth checking the keystem 8115 E is shifted and the keystem is returned to resting position by spring B 76 ½ E. The cycle ends with oper. (22) motor stop.

TOTAL KEY CONTROL - FIRST CYCLE

By depressing the total key the following operations are performed: oper. (23) machine start, oper. (24) locking of rake and printing assembly, oper. (4) locking actuation, oper. (3) disengagement of totalizer (reversed), and oper. (8) restoring of the tens transfers.

41) **Return of totalizer to positive operation.** About in the middle of the forward phase lever ZS 926 E controlled by main shaft ZK 130 EF and returned in lower position — since bridge ZK 266 E positioning it has returned to resting position at the end of the precedent cycle — engages the lower stud of rocker arm 300 K 914 F and rotates it. In its rotation, this draws downwards, by means of stud 933, the assembly of levers 913 and 919 and these, then, lower and locate the totalizer in positive.
Oper. (15) meshing in control of the totalizer follows with the values of the tens transfers returned. Almost at the end of the first cycle the following operations take place: oper. (25) tens transfers locking and oper. (26) unlocking of calculating sectors and slow-down in machine speed.

SECOND CYCLE

We have the following operations:
oper. (27) unlocking of rake assembly and of digit and sign bars, oper. (28) totalizer clearance and printing of total stored, oper. (29) restoring of total key, oper. (30) totalizer disengaging control and so forth as in the cycle of the total in addition.

SUBTRACTION WITH NEGATIVE TOTAL - Succession of phases

This is the case when the plus item is smaller than the minus item.
The entry of the plus item and its transfer to the machine are performed according to the addition normal operative cycles already described.

FORWARD PHASE

The entry of the minus item is made according to the following operations: oper. (34) entry of the minus item, oper. (11) controlling the printing in red, oper. (3) totalizer disengagement, oper. (4) locking of numeral keys and stop carriage, oper. (5) disengagement of digit bars, oper. (6) loading of printing hammers, oper. (7) engagement control of stop knife, oper. (35) locking of total and sub-total keys oper. (36) disengagement and stopping of sign bar, oper. (37) reverting the totalizer.

42) **Pre-setting of credit balance sign.** During oper. (37) reverting the totalizer, the totalizer ZK 900 EF draws with its stud 30.264 lever assembly MK 424 E which glides on the right plate guides of assembly ZK 400 E.
On this same right plate is also assembled the control assembly of part WSK 434 E, which is connected elastically by spring W 428 to lever assembly MK 424 E. Upon the vertical motion of the latter, assembly WSK 434 E rotates on its pivot until it leans with its lower tail against the stud of the first tens transfers unit 12 SK 404 HE.
The totalizer rotates further drawing assembly MK 424 E that stretch the spring maintaining it loaded. The following operations then take place: oper. (11) and (12) printing control in red, oper. (10), ribbon motion control, oper. (13) pre-setting for clearance of the number entered, oper. (14) pre-setting of paper spacing (1 space).

RETURN PHASE

It begins with oper. (38) totalizer engagement control, oper. (16) disengagement of stop knife and oper. (17) disengagement of anti-bounce ratchets and start of restoring to zero of bars.

43) **Clearance of totalizer and fall of tens transfers.** The return to zero of assemblies MK 600 E rotates the corresponding subtraction pinions of the totalizer ZK 900 EF, which will thus be cleared of the value of the minus item.
When the pinions have reached in their rotation, with their carry-over tooth, position 1, but they have not been fully cleared, they make fall the tens transfer of the next pinion on the left. When this phase takes place on the pinion of the first significant digit, said pinion causes the concerned tens transfer to fall, as well as all the successive to the last one, since in succession

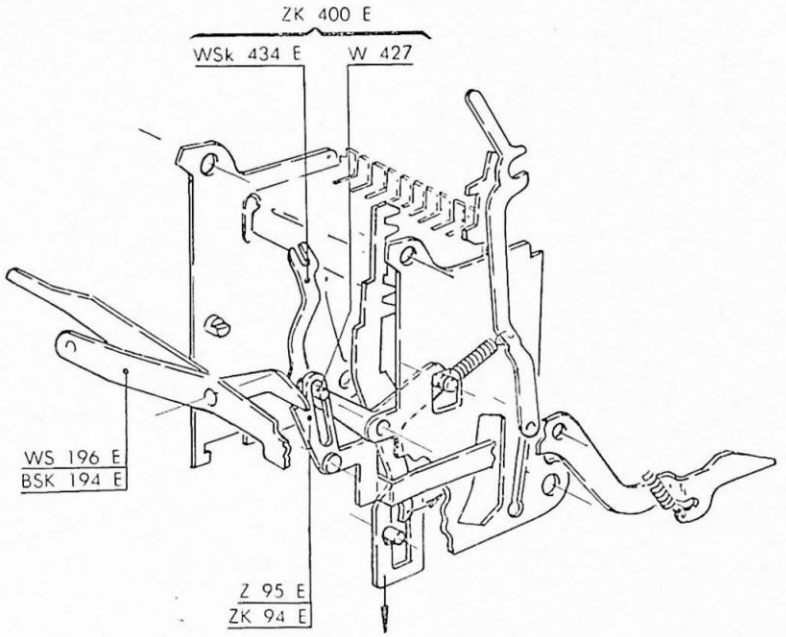


fig. 25

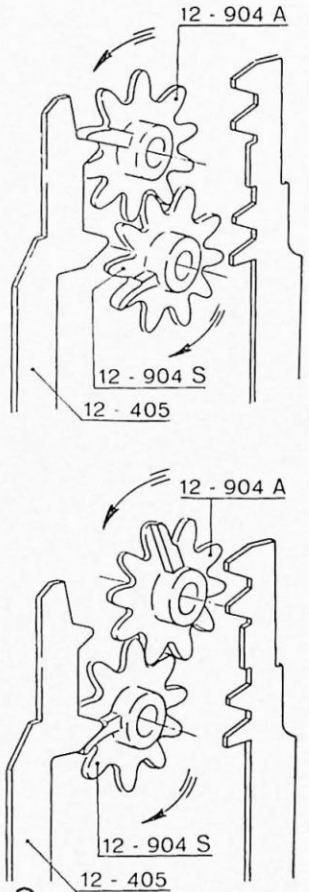


fig. 24

to the left they meet, in their fall run, by means of the slanted profile of their lower nose, the carry-over tooth of the pinion. They slide backwards on same disengaging catch 12-406 of the next left transfer, which falls in its turn and repeats the disengaging motion with respect to the carry-over tooth of the next left pinion.
This takes place up to the maximun capacity of the machine until said motion is transferred by the last transfer to bridge 12 SK 430 E which transfers the disengaging motion to the first tens transfer at right, making it fall.
All this occurs because the totalizer pinions mesh in between them in a certain phase, on account of which the positive pinions have their carry-over tooth corresponding to zero. Whereas, the negative pinions have their carry-over tooth corresponding to position 9 with respect to the double stop tooth of the tens transfer release lever 12-405 (fig. 24).

44) **Showing of the visible sign of credit balance.** When the first tens transfer on the right, i.e. 12 SK 404 HE, falls, it disengages from the contrast of its stud the control assembly of part WSK 434 E. This under the action of the loaded spring W 428 rotates until it is stopped by the slot of the side plate of assembly ZK 400 E. Part WSK 434 E controls lever WS 483 E with the fork of its upper arm placing it with the red sign to appear through the window opened above left in the keyboard plate M 195 E.
Therefore, any time the red sign is showing the machine, or better said the totalizer, is in credit balance.

45) **Pre-setting totalizer locking in negative.** During the movement of assembly WSK 434 E in oper. (44), this pre-sets, by means of stud W 427 (fig. 25), ratchet Z 95 E assembled on lever assembly ZK 94 E in engagement position with the rocker arm WS 196 E of assemply BSK 194 E.
The phase goes on with the following operations:
oper. (19) unlocking of keyboard, oper. (20) clearance control, oper. (21) paper spacing control, oper. (40) key restoring and ends with oper. (22) motor stop.

TOTAL KEY CONTROL - FIRST CYCLE

By depressing the total key the following operations are performed: oper. (23) machine start, oper. (24) locking of rake assembly and printing, oper. (4) locking of numeral keys and stop carriage, oper. (3) disengaging the reversed totalizer.

46) **Totalizer locking in the negative.** At the beginning of the forward phase of the first cycle the lever assembly ZK 94 E, which receives the control from the roller Z 1403 assembled on the main shaft ZK 130 EF, engages by means of its ratchet Z 95 E pre-set as per oper. (45) the rocker arm W 196 E rotating it. This arm has its other end engaged in the fork of assembly ZK 197 E and rotates it, thereby leaving free the reverse control lever to lift and draw the sub-

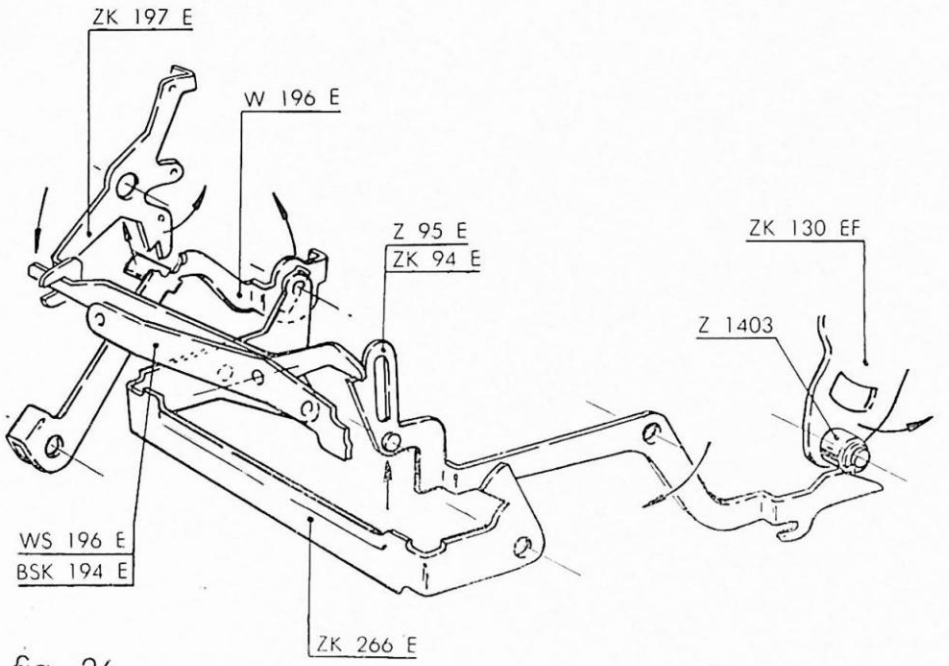

ZK 197 E
W 196 E
Z 95 E
ZK 94 E
ZK 130 EF
Z 1403
WS 196 E
BSK 194 E
ZK 266 E

fig. 26

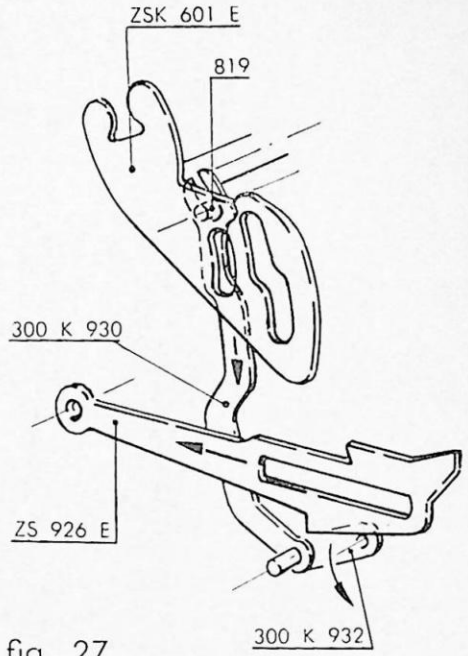


fig. 27

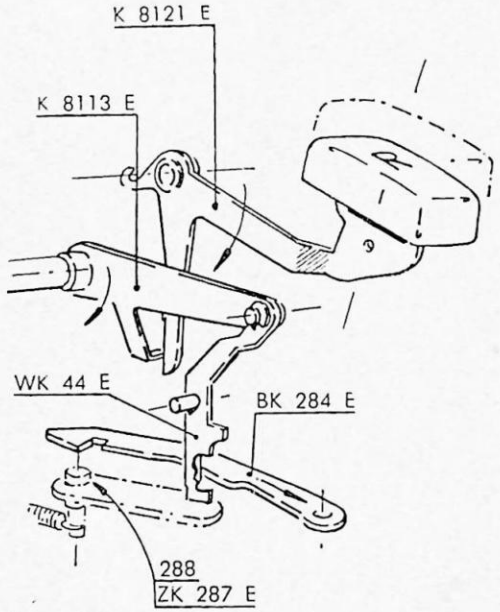


fig. 28

traction bridge assembly ZK 266 E, as soon as assembly ZK 18 E has moved upon actuation by the main shaft ZK 130 EF through cam lever ZK 35040 EF (fig. 26).
In its rotation, the subtraction bridge assembly being engaged by its stud 7570 in the slot of lever ZS 926 E, lifts and places it in such a way that during its run controlled by the main shaft ZK 130 EF it should not actuate the inversion of the totalizer but keeps it locked since same is already in the negative position.
Thereupon follows immediately oper. (8) restoring of the tens transfers and the engagement of the reversed totalizer with the value of the tens transfers that might be restored.

47) **Pre-setting of the totalizer locking in negative in the negative cycle.** During the engagement of the reversed totalizer, assembly ZSK 601 E that actuated it keeps down with its stud 819 lever assembly 300 K 930. This is assembled on arm 300 K 932 and keeps it off the forward movement of lever ZS 926 E in the second revolution for the total, to avoid the return thrust to the positive of the totalizer meshed in with sectors MK 600 E (fig. 27).
The cycle is completed by oper. (25) locking of the tens transfers and by oper. (26) unlocking of the calculating sectors and slow-down of the machine.

SECOND CYCLE

We have the following operations:
oper. (27) unlocking of the rake assembly and of the digit and sign bars, oper. (11) red printing control, oper. (28) totalizer clearance and printing in red of the total stored, oper. (29) restoring of the total key, oper. (30) totalizer disengagement control and so forth as in the cycle of the addition total.

REPETITION OF A NUMBER

A number entered can be repeated as many times as the R key is depressed, which has the purpose of clearing the number entered.

48) **Cancelling clearance.** When actuating R key lever K 8121 E, it disengages from its ratchet and with its lower tail it rotates arm assembly K 8113 E. This draws downwards in its movement latch assembly WK 44 E which by gliding in the proper slot of the bottom keyboard plate ZK 248 E protrudes in the lower part with its bent lug (fig. 28).
In this way, ratchet BK 284 E meets on its path, in the return phase of the machine, part WK 44 E keeping it off roller 288 of the clearance lever ZK 287 E and does not restore the stop carriage to zero.

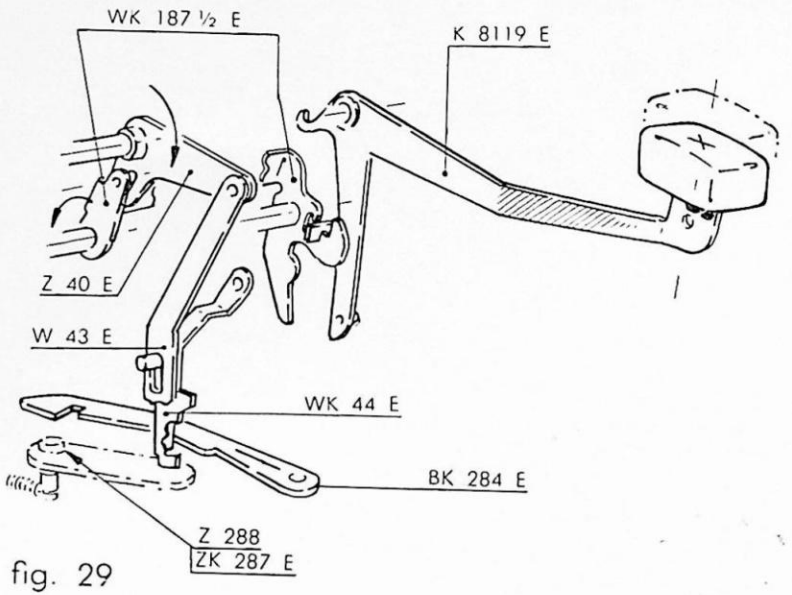

WK 187 ½ E
K 8119 E
Z 40 E
W 43 E
WK 44 E
BK 284 E
Z 288
ZK 287 E

fig. 29

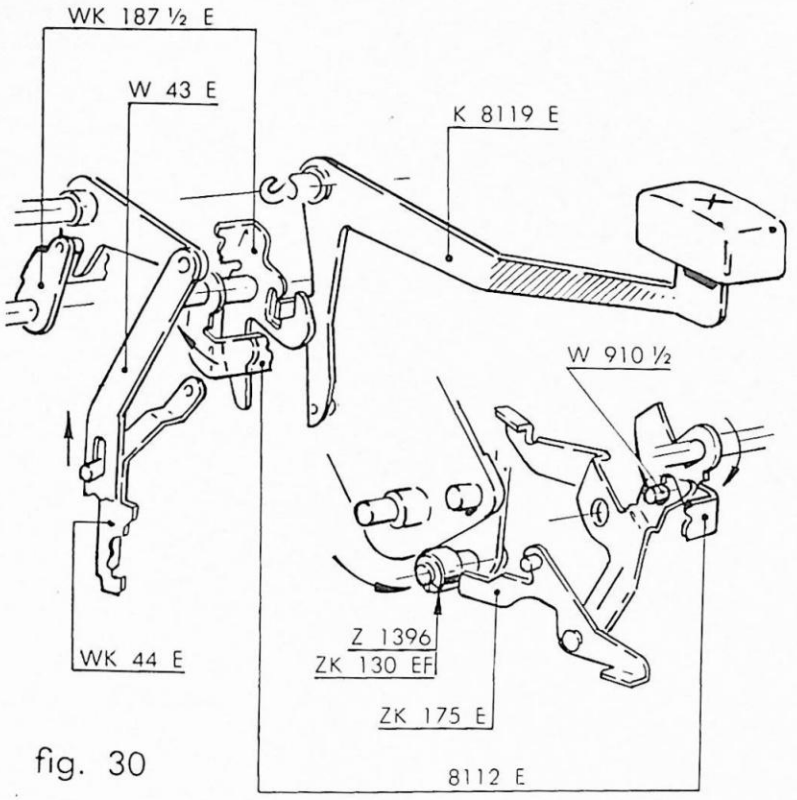

WK 187 ½ E
W 43 E
K 8119 E
W 910 ½
WK 44 E
Z 1396
ZK 130 EF
ZK 175 E
8112 E

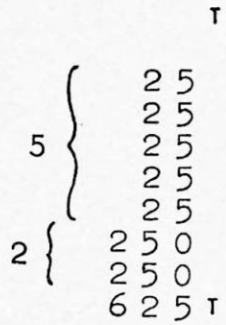
fig. 30

MULTIPLICATION

The machine also performs multiplications by means of successive additions of the value of the multiplicand equal to the digit of units of the multiplier. Then by shifting the multiplicand of one column, again a succession of additions equal to the digits of tens of the multiplier, etc. The automatic column shifting is given by the particular feature of the X key control. This, besides acting as a repeater, controls the shifting of the stop carriage and enter a cipher every time it is actuated and successively released.

SUCCESSION OF THE PHASES

The entry of the multiplicand in the keyboard is made according to oper. (1) and (2).



49) **Control of the X key (see example on the right).** Depress X key, keeping it down for as many complete cycles as the value of the last digit of the multiplier.

This disengages ratchet WK 187 ½ E which rotates and with its stud actuates lever Z 40 E. This pushes downwards rod W 43 E that draws latch assembly WK 22 E. Latch WK 44 E is thus pre-set for oper. (48) cancelling clearance. Therefore during five allowed cycles the multiplicand is transferred to the totalizer and the value is printed on the tape (fig. 29).

Rod W 43 E disengages bridge W 35055 E from the nose of support K 8102 E letting slider K 8101 E glide under the action of spring B 631. This slider stops when the tongue of bridge W 35055 E leans against the end nose of rod W 43 E.

The understated operations follow:

(3), (4), (5), (6), (7), (8), (10), (12), (14), (15), (16), (17), (18), (19), (21).

50) **Restoring of X key.** In the fifth cycle we release the X key. Almost at the end of the return phase, roller Z 1396 assembled on the main shaft ZK 130 EF meets and pushes the restoring assembly ZK 175 E which, by means of stud W 910 ½, transfer motion to bridge 8112 E that rotates disengagement device WK 187 ½ E. In this motion the tooth is shifted that checks keystem K 8119 E, which will be restored. The disengagement device WK 187 ½ E brings again to its resting position latch WK 44 E and rod W 43 E (fig. 30).

The latter disengages its nose from bridge W 35055 E, which by means of its slider K 8101 E, returned by spring B 631, glides for the whole length of the slots of support K 8102 E. In this movement, bridge WK 35056 E is taken out from the engagement between the ratchet W 35052 ½ and the milled stud W 35045 E leaning freely against the lug of the cipher advance lever ZK 35050 E.

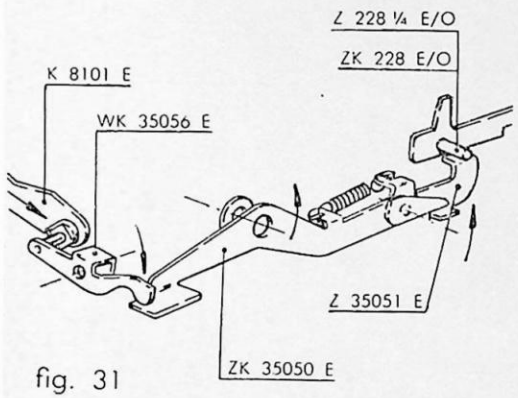


fig. 31

51) **Advance control lever of the cipher.** Immediately afterwards, assembly ZK 35040 EF controlled by the main shaft, rotates forward together with bridge Z 35049, which by means of its slot engaged on stud 8303 of slider K 8101 E restores it.

When the milled stud of the slider (fig. 31) meets the stud of bridge WK 35056 E, it makes it glide on the slant and rotates it, compelling it with the other arm to press upon and lower the cipher advance lever ZK 35050 E.

Under the action of bridge WK 35056 E, this lever controls, by means of its right articulated end Z 35051 E, stud Z 228 ¼ E/O of the cipher entering lever ZK 228 E/O, displacing the stop carriage of one step to the left.

In the last part of the run of slider K 8101 E, bridge WK 35056 E is brought back to its resting position by ratchet W 35052 E and bridge W 35055 E hooks on the nose of support K 8102 E disengaging the motion transfer mechanism.

Oper. (22) motor stop follows.

By depressing again the X key for two complete cycles, i.e. as much as the value of the other digit of the multiplier, oper. (49) is repeated, with the difference that the value entered is stored and printed one step further to the left.

52) **Clearance of the stop carriage.** In the first cycle of the total, besides the restoring of the tens transfers, there takes place also the clearance of the stop carriage at the end of the machine cycle.

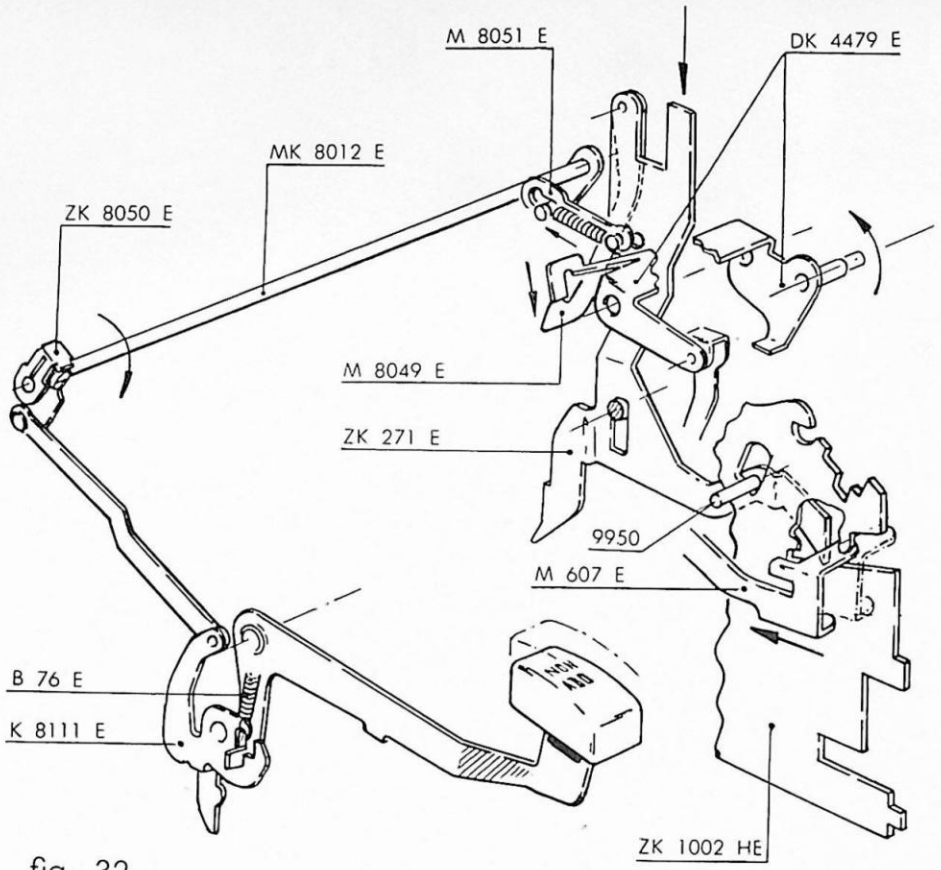


fig. 32

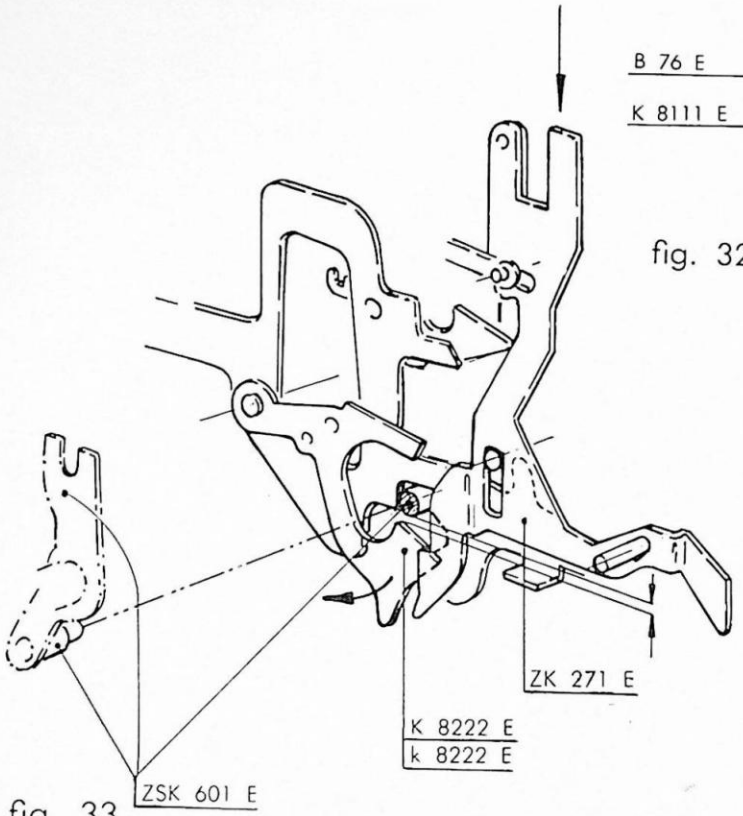


fig. 33

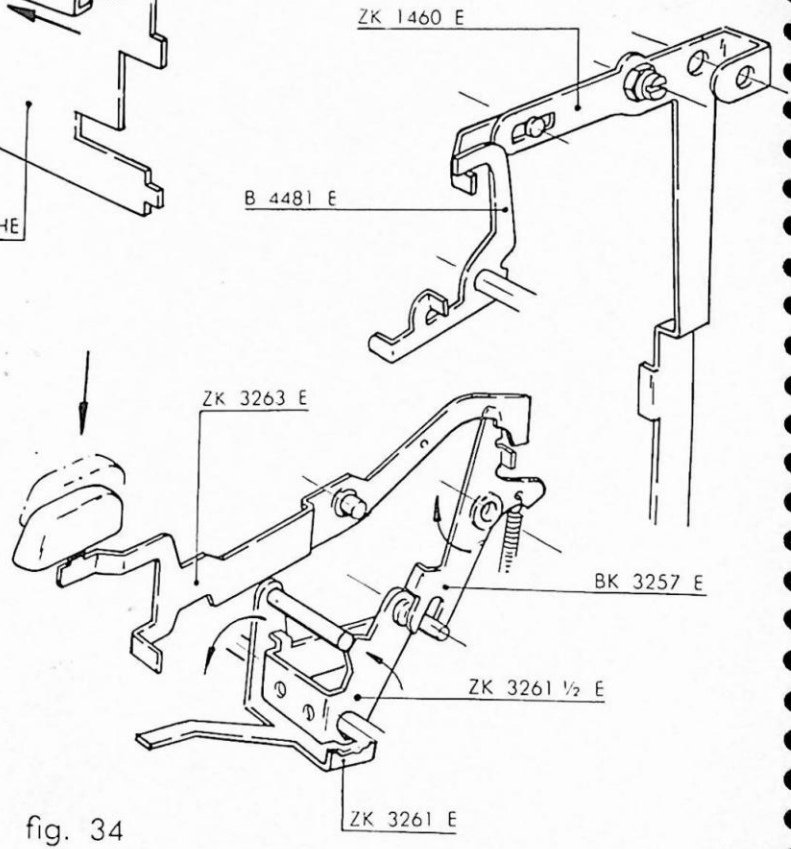


fig. 34

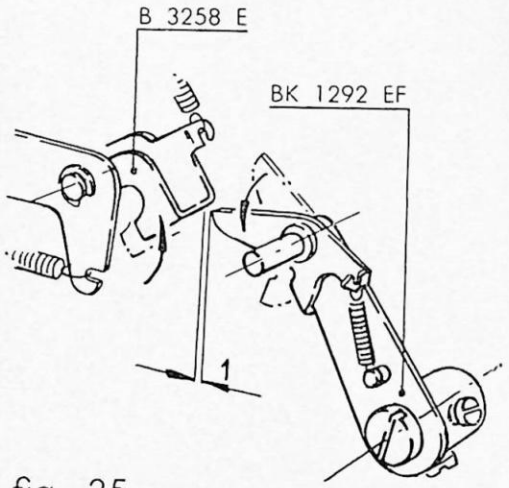


fig. 35

NON ADD - PRINTING OF A NUMBER WITHOUT SUMMING UP

The entry in the keyboard of a number is made according to oper. (1) and (2).

53) **Control of " NON-ADD " key.** When depressing the NON ADD key, this will disengage ratchet K 8111 E, which rotates upon the action of spring B 76 E, whereas with the stud on the upper tail it draws the holdfast ZK 8050 E. This assembled on the shaft by means of connecting rod MK 8012 E and rotates it.

This elastically draws connecting rod M 8051 E and this pre-sets ratchet M 8049 E for the action of bridge DK 4479 E. The bridge lowers upon the start of the machine and drives ratchet M 8049 E and lever assembly ZK 271 E linked together (fig. 32). During this movement, lever assembly ZK 271 E, by means of stud 9950 disengages from the step on side frame ZK 1002 HE the lever M 607 E and let it glide in the slot, whereas it checks it with the front part of its level arm. In this position, the sign sector assembly MK 600 ½ E is pre-set for the printing of the " N " sign. Morevoer, this assembly keeps down with its back lug the ratchet K 8222 E of the latch assembly K 8222 E so that the totalizer ZK 900 EF does not get near to the sectors MK 600 E.

Under this condition, the machine completes its cycle by printing but not summing up the value entered (fig. 33).

CORRECTION OF A NUMBER ENTERED

To cancel a number entered, depress correction key.

54) **Control of correction key.** By depressing the correction key, lever ZK 3263 E releases assembly BK 3257 E, which starts the machine.

At the beginning of this forward phase, locking B 4481 E holds back assembly ZK 1460 E as in oper. (24) and this locks the rake assembly, which holds back sectors MK 600 E. The complete cycle ends with the following main operations: oper. (19) unlocking of the keyboard, oper. (20) clearance control, oper. (22) motor stop (fig. 34).

Of particular importance is the in-phase putting of assembly BK 1292 EF, which restores the bridge for the return to resting position of the release for the motor keys.

When the machine is in resting position, the elastic tail of said assembly should not have more than 1 mm clearance at the point with respect to the edge of bridge B 3258 E (fig. 35).

MAINTENANCE INSTRUCTIONS

The entry by actuation of a numeral key is hard

If the depressed key does not move freely, check that:

— the keystem runs freely in the relative slots of the keyboard plate MK 251 E and in the plate 12 - ZK 227 E

— the parallelism between keystem levers and the pin entering lever exists

— by unhooking spring 7680 ½ from the escape bracket 8295, this lowers and lifts freely also when depressing the numeral key

— after having taken the stop carriage out of the keyboard, the pins run freely only by their own weight. In case they should not run freely enough, wash carriage in a mixture of gasoline and 5 % oil.

Entry of a number does not take place

Check that:

— the total and sub-total are restored then when the total and sub-total keystems are free to run in the slot of the keyboard plate

— latch assembly K 8222 E sufficiently restores assembly ZK 10 E and related chain-linkage

— lever BK 284 E hooks on to roller 288 of clearance lever ZK 287 E restoring it to zero and that the eccentric stud Z 7740 E is adjusted in such a way that at the end of its run it will disengage said lever BK 284 with a further safety of run of the stop carriage, towards the right, of 1 mm after the resting position.

Stop carriage escapements are slow

Check that:

— when setting the stop carriage to full capacity, unhooking spring Z 69 E and returning slowly by hand the stop carriage there are no hindrances along the rail (dirt or dents).

Eliminate by cleaning or straightening out.

In case the ultimate escapements should be slow, make sure that spring Z 69 E is an order and in case replace it. Or control the parallelism of the guiding rods with respect to the square slots of the stop carriage.

When entering a figure a nine is thrown out

Check that:

— when depressing and keeping down a numeral key, the entering tooth of the escapement bracket 8295 E does not protrude above the upper plane of bridge 12 K 246 E (see fig. 1)

— the entering tooth of the levers of series 228 is higher by 1 mm than the entering tooth of escapement bracket 8295 E

— a rod 224 is not damaged on the point, so as to be shorter than the other ones. Measure it from the slot to the point and in case replace defective rod

— the supporting arm of the pin is not broken — replace the complete carriage

— the escape bracket of the stop carriage is sufficiently actuated upwards, so as to hold back the selecting tie rod Z 605 E.

One or more digit bars do not go up or print a lower digit than entered (levers are hard)

Check that:

— the selecting tie rods Z 605 E do not go too near the top of the pins and in case engage them, stopping before the number entered. Check that the guiding rods 253 are perfectly straight

— the anti-bounce ratchets are ready to spring upon the action of their spring Z 505 V

— the printing bars MK 611 E and relating assembly MK 600 E are free. To check this, proceed as follows: take out the three springs B 617 E, Z 505 E, B 627 E from the concerned sector and take out the totalizer. Depress the TOTAL key to eliminate the action of the escape bracket, rotate the machine by hand until the rake has been brought completely in the upper position with the stop knife not yet engaged. In this position, the bar can be lifted and run by hand, holding the anti-bounce ratchet disengaged, to find out the points of friction in the various guiding racks

— springs B 627 E are in working order and not slack. In this case replace them.

One or more bars do not print the digit or sign entered

Check that:

— ratchet 12 Z 705 rotates freely without spring, that its spring is in working order and that after the first movement of sector MK 600 E it hooks on firmly with the first tooth to the hammer to load it. Check the engaging teeth

— assembly BK 141 E, by means of bridge BSK 714, controls the release of parts 12 Z 705 E and that these after the release of the hammers 12 K 709 E with the second tooth check the hammers. Check that the release succession takes place gradually from left to right

— the printing bar, when operating the machine slowly by hand, will follow the hammer in its backward movement during the loading, remaining in touch with it.

One or more bars escape after a total

Check that:

— upon the disengagement of the sectors from the totalizer, this will not give vibrations to the frame carrying the stops 12 720 E, since these can bounce and permit the escape of the sectors MK 600 E. Clean cams ZSK 601 E

— the frame 12 K 722 E and the stops 12 - 720 E can move freely on account of their own weight

— in the case only a single bar should escape, push slightly backwards and bend the concerned stop 12 - 720.

Defective printing of the digits and signs

Check that:

— the engagement of the stop knife produces the correction, i.e. that the printing bars should go down mm 0.2 to 0.3. If this does not happen, check the state of wear of the knife and of the locating teeth of the sectors and replace them if needed

— the hole of the rod M 610 E, through which the bar goes, is not ovalized. If needed, replace rod

— the printing bars go upwards parallel, otherwise a differently spaced printing would result. Align bars

— the printing bars are parallel to the side plates of the machine, otherwise we shall have a printing slightly shaded on one side. Straighten out with two pliers acting in contrast

— the ribbon lifting levers HK 527 HE - 300 K 527 V maintain the ribbon at about 1 mm. From the rubber platen. Otherwise the tight ribbon does not allow the bar to print, especially as far as the bars to the extreme left and right are concerned. This main defect shows by the reverse motion of the ribbon. Make the mechanism smoother by adjusting the clutch of the spools.

Digits print twice, but slightly displaced

Check that:

— after the engagement of the stop knife the tongue of the assembly BK 141 E should control bridge BSK 7 14 E, so that the stroke of the levers happens gradually from left to right with a safety, upon printing, of approximately 1 mm. If this does not happen, adjust tongue of the BK 141 E.

— Should the displaced printing be found only in one of the first 4 columns on the left, check that the anti-vibrations rack 12 K 30233 E glides freely in the slots of frame BK 30232, that spring 10.300 is in working order and that the hammers are in touch with the slanted plane of the rack teeth towards the central area.

Defective printing of points

Check that:

— the multifaced shaft B 3494 is exactly adjusted, so as to allow the passage of the comma hammer tangs

— the comma hammer tangs correspond° to the slots of cross piece 12 K 3420, in all the positions

— when the machine is in resting position, the comma hammers should be restored by the multifaced shaft and allow the cross shifting of part 12 K 3420

— the comma hammers are free to rotate between the hammers 12 K 709 and glide freely in the guiding slots of frame 12 SK 712

— the spring of the comma hammer is not weak.

Ribbon reverse motion takes place too soon

Check that:

— the two leaf springs Z 508 do not have too much friction on the bushing of plate ZK 523 E

— there is enough lubricating grease between leaf springs Z 508 and relating bushings of plate ZK 523 E.

Two-colour printing

Check that:

— the distribution of the inking in the two colors is not irregular

— (only in the case of red printing) the ribbon has gone upwards enough, when the printing stroke begins. In case of two-color printing, adjust the arms of assembly BK 530 E

— the supporting planes of assembly BK 530 E go freely downwards when in touch with the hammers shaft, so that the ribbon will not remain up and leaves reading free.

Paper oscillation

Act upon the front lug on the left of paper-carrying frame BK 1124 E in such a way that ratchet B 1142 ½ E, driving the roller disengages from the toothed wheel when the roller itself is localized, does not rotate it.

Check of the clutch between motor and machine

Check that the adjustable elastic thrust of the star-shaped spring washer has remained unchanged in its working conditions. To do this start the machine and put in a contrast in the hole made in part ZK 108 E to avoid oscillation of connecting rod ZK 1205 E.

The machine stops, whereas the motor goes on rotating and produces the slipping of said clutch. Try operating more times in this way, then begin operations with total and partial balances, without slipping taking place in the coupling. In case adjust the thrust of the star-shaped spring washer by means of the special toothed nut.

Maintenance of the motor

Should the motor work with irregularities, check that:

— the brushes glide freely in their relative brush-holders and that they are not fully worn out

— the collectors are clean. In case clean them with the special brush when they are in movement

— if the collectors are noisy and squeal, spread lightly the special paste on the collectors in movement

— when the machine is in resting position, the platinum contacts have a distance between them of about 1 mm and that they are not too much oxidized. In such a case, replace the contacts

— when the contacts are near, their planes fit well one to another

— the bronze blade closes the circuit upon its contact somewhat in advance in connection with the platinum contacts

— the bearings are periodically lubricated with mineral oil, through the special holes and after having loosened the relative screws closing them. The internal wicks must be pressed to obtain a better absorption of lubricate

— the speed of the machine, normal and in total (slowed-down), adjusting the revolutions of the motor by regulating the centrifugal governors.
Should the motor not start, in spite of the circuit being closed, disconnect the cord, rotate the rotor of about 15°-20° and connect cord again. If the motor starts, this means that the portion of winding ending at the two blades of the collector, which is stopped in the previous position in correspondence of the brushes, is interrupted. In this case, replace motor.

LAGOMARSINO

TOTALIA

mod. 8441

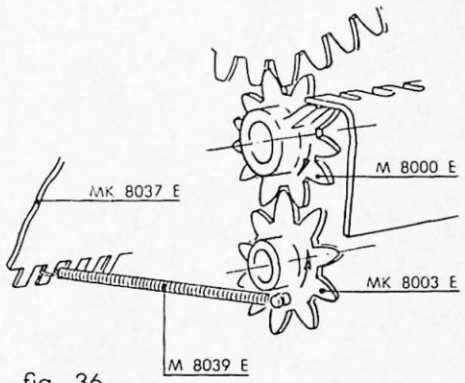


fig. 36

AUTOMATIC REPEAT DEVICE

This device applied to the STANDARD machine model changes it into model 8441 and is composed of three different units of motion transmission mechanisms:

1) Recall and clearance automatic device upon repetition

2) Engagement and repeat control

3) Automatic pre-setting control

1) **Recall and clearance automatic device upon repetition.** The calculating unit 12 MK 601 EF carries sectors MK 620 E equipped with additional lower teeth of special profile, where pinions M 8000 E can mesh in.

Said pinions are supported and rotate on the shaft M 8006 assembled on swinging support MK 8037 E. Said support is assembled in its turn, through shaft M 8008 E, on frame MK 8027 E. This frame has a reference point to the machine on shaft 8291 E and is fixed to the base cross piece. The swinging support MK 8037 E is composed of a series of memory pinions M 8000 E meshing in with a lower series of clearance pinions MK 8003 E. On these pinions there it a shackle where spring M 8039 E is hooked on. This serves the purpose of constantly returning the memory pinion M 8000 E, so that its carrying-over tooth will always be in touch with the small teeth of the zero positioning square piece assembled on the swinging support MK 8037 E. It should be said that the memory pinions, when the machines does not operate, are always in mesh with the calculating sectors MK 600 E (fig. 36).

For the safety of column alignment, the calculating sectors MK 600 E are guided in their lower part by a square piece M 8024 E making a single block with the fixed support MK 8027 E.

The swinging support MK 8037 E takes two positions determined by the stops of shaft M 8040 E (cushioned in their locating impact by two elastic washers M 8007) made in two windows of support MK 8027 E and secured by the action of spring M 97 E. The oscillation in said two positions of support MK 8037 E is produced by the rotation of shaft with cams MK 8036 E. Said shaft is assembled and rotates on two bearings M 8032 engaged in the suitable slots of frame MK 8027 E. It is supported at its right end by a square piece M 8296 E fixed under the base.

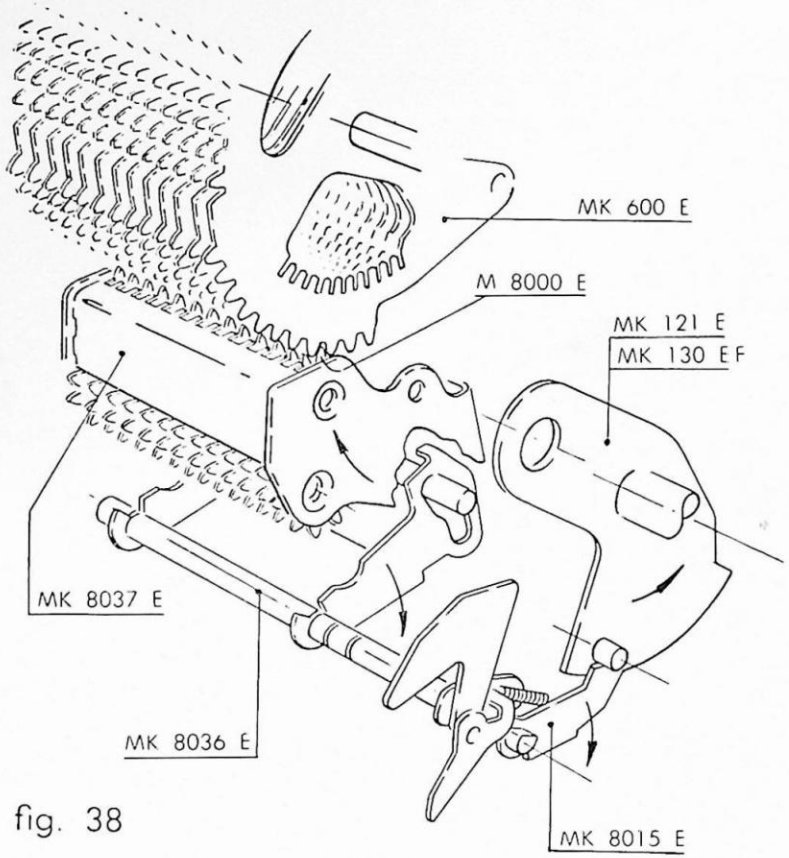

MK 600 E
M 8000 E
MK 121 E
MK 130 EF
MK 8037 E
MK 8036 E
MK 8015 E

fig. 38

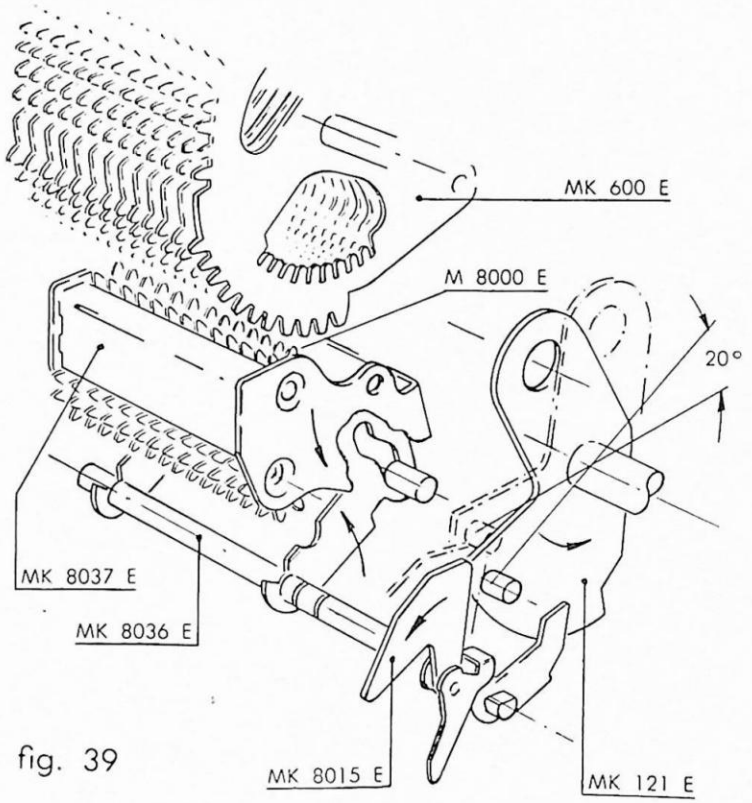

MK 600 E
M 8000 E
20°
MK 8037 E
MK 8036 E
MK 8015 E
MK 121 E

fig. 39

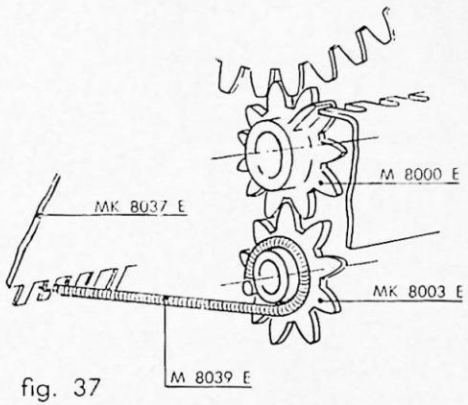


fig. 37

Spring M 8039 E is hooked on to the shackle of the zero positioning pinion MK 8003 E and this must have such a meshing in phase with respect to pinion M 8000 E that by rotating it to the 9 tooth the spring will wind around the hub, without making more than one complete turn and interfering with itself (fig. 37).

2) **Engagement and repeat control.** Assembled on the machine main shaft MK 130 EF, right cam MK E carries a special profile and a control roller. Shaft MK 8036 E has keyed on its right end a cam bridge MK 8015 E on which is assembled a table ratchet. On the same shaft oscillates a bridge, the roller of which is engaged by the profile of cam MK 121 E that controls it at any beginning of cycle of the machine.

On the contrary the control roller on same cam MK 121 E acts upon the profile of bridge MK 8015 E always at the end of the cycle of the machine. In this way, it operates the meshing-in with the calculating sectors of the memory pinions on the swinging support MK 8037 E (fig. 38).

3) **Automatic pre-setting control.** The feature of model 8481 with automatic repeat is that the pre-setting of the motion transmission mechanism is not obtained by manual controls, but by the position taken by the stop carriage, i.e. depending on the fact that same is in resting position or is loaded even with a single digit.

This occurs through a chain-linkage that originates from stud Z 293 ¼ making one block with stop carriage MK 233 E. The machine being in zero position after a total balance, enter any digit. Stud Z 293-¼ has gone out of the control path of cam lever MK 8019 E which remains free and being returned by spring 35029 displaces bridge MK 8018 E through its elastic rod by means of spring M 8129.

The lower stud W 633 of bridge MK 8018 E produces the shifting of the table ratchet M 8005 E assembled on bridge MK 8013 E and places it, as it is returned by spring M 8128, under the action of the roller of control cam MK 121 E. In the first 20° of the machine cycle, the table ratchet receives from the roller a downwards thrust, which will rotate bridge MK 8015 E and as a consequence the shaft with cams MK 8036 E. We have in such way the disengagement of the memory pinions from the calculating sectors (fig. 39) and the possible automatic zero positioning of the pinions through the action of springs M 8039 E drawing the clearance pinions MK 8003 E.

The memory pinions are thus ready for meshing-in with the calculating sectors rotated according to the number entered.

As pointed out, this meshing-in takes place at the end of the forward cycle by means of the roller on cam MK 121 E which meets the profile of bridge MK 8015 E.

The machine thus ends its cycle by the final clearance of the number entered.

The stop carriage is thus in resting position and with its stud Z 293-¼ it has recalled in the starting position the lever and the rod of chain-linkage MK 8019 E.

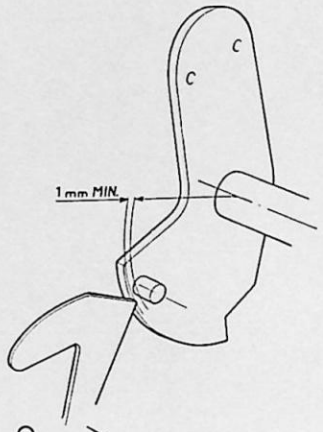


fig. 40

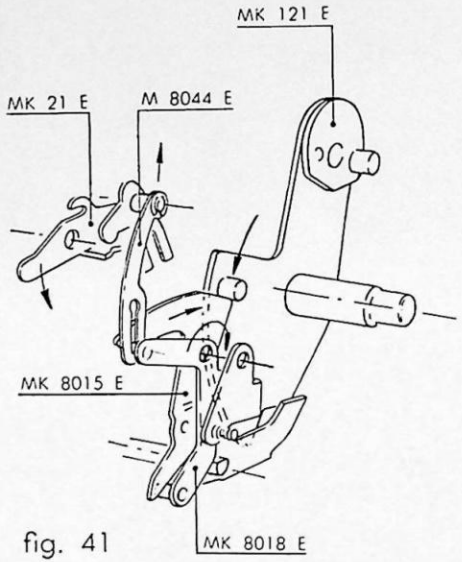


fig. 41

Bridge MK 8018 E has shifted and with it stud W 633 it has again actuated the table ratchet of bridge MK 8015 E, taking it away from the path of the roller on cam MK 121 E. Without entering successively a digit or a number, you can at will operate with any of the control keys recalling in the machine by an action of automatic repeat the number calculated last.

In the following cycle or cycles, without entering, the roller on cam MK 121 E passes beside the table ratchet without actuating it and with a safety not less than 1 mm (fig. 40), leaving the memory pinions in mesh with the calculating sectors. The profile of cam MK 121 E immediately controls bridge MK 8016 E that rotates and pushes upwards with its front hook the bridge MK 8018 E assembled on bridge MK 8017 E. This rotates and pushes the rod and then lifts lever MK 8021 E, which rotates with its front protrusion the front bar for the lowering of the escape table of the stop carriage MK 233 E.

Tie rods Z 605 E of the calculating sectors remain free and release accumulating and printing the value of the digit or number stored in the previous cycle by the memory pinions. These so replace the pins of the stop carriage for all the desired positive or negative repetitions.

In a case of a partial or total balance there is the same action of restoring to zero of the memory pinions, which takes place in the idle cycle before the throwing-off of the balance. This occurs even if the stop carriage has been restored to zero by the small tie rod M 8044 E.

When the keys of the partial or total balance are lowered, bridge MK 21 E rotates and lifts above-mentioned tie rod that acts upon bridge MK 8018 E. This releases the table ratchet of bridge MK 8015 E which places itself under the action of the roller on cam M K 121 E (fig. 41).

The memory pinions disengage in this way from the calculating sectors and in the following cycle they store the value of the balance thrown off by the machine.

If the stop carriage is not set, there can be in the successive cycles the automatic repetition of the last partial or total balance.

This can happen also — in spite of the fact that the chainlinkage MK 8019 E is controlled by the stop carriage — because bridge MK 8018 E can be returned by the tie rod M 8044 E since it is connected elastically through spring M 8129. It can thus be understood how on the models of machines equipped with this device the repeat key has been suppressed, as well as the locking of the calculating sectors after the total balance, since in their place there is the engagement of the memory pinions which prevent them from escaping.

MAINTENANCE AND ADJUSTMENT FOR AUTOMATIC REPETITION DEVICE

When the machine during the automatic repeat operation should give wrong results, check that:

— the pinions of the memory assembly are not slow on their shaft. Disassemble the pinions and wash them carefully with a mixture of gasoline and 5 % oil. Or one of the pinion return spring M 8039 E could have broken or unhooked. In case, replace spring. Check that the pinion catches on frame MK 8037 E are not out of shape

— spring M 8129 is not weak and i.e. controls securely bridge MK 8018 E, which transfers the engagement and disengagement control of the memory pinions

— the escape plate moves downwards with a safety margin. Check that upon the control of cam MK 121 E bridge MK 9016 E pushes bridges MK 8018 E and MK 8017 E and these, in its turn, the chain-linkage MK 8021 E, M 280 E controlling the escape plate.

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mod. 8641

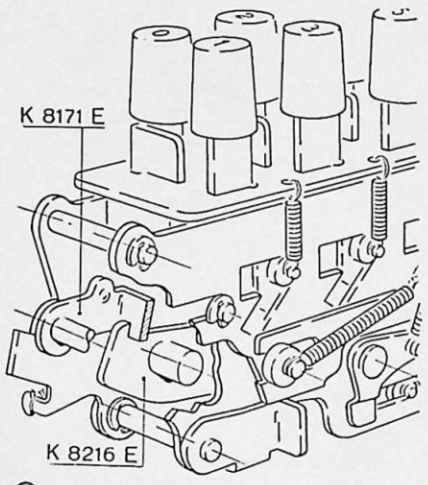

fig. 42

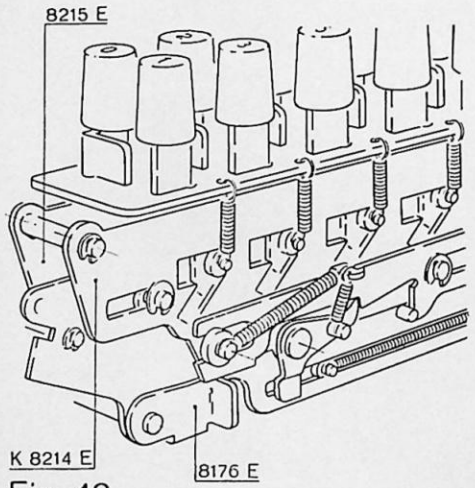

Fig. 43

MULTIPLICATION KEYBOARD

The device applied to the STANDARD model of machine changes this into model 8641 and is composed of 5 different units of motion transmission mechanisms, namely:

1) Device for release and automatic counting of the cycles

2) Counting device of the multiplier

3) Column automatic step-over device for multiplicand and multiplier

4) Connections and starting functions of the machine and 2 clearing cycles

5) Locking and safety devices against excess capacity.

1) **Device for release and automatic counting of the cycles.** Above device, composed of units of motion transmission mechanisms located between two side plates, has been added on the left side of the machine. These units find their reference for assembly purpose on the machine in the hammer frame upper shaft, in the keyboard upper shaft and in the indent of the keyboard front plate.

This operating unit is assembled separately and its motion can be checked and inspected before being placed in the machine. On the front of the two side plates is assembled the releasing lever system consisting of a cam bridge 8176 E, which by its motion releases the bridge pawl K 8171 E. A rack K 8216 E (fig. 42) hooked by its trip to said pawl has its sliding guides in the long slots made in the supporting side plates, namely K 8226 E (left) and K 8227 E (right).

On its front part and under the trip, rack K 8216 E has a stud protruding on both sides, which acts as a selection stop for the multiplier units.

The units of the multiplier are determined by the lowering of the digit keystem of the multiplication keyboard. These levers glide vertically in the slots of the supporting side plates and bear at their upper end the tangs which receive the red keytops. From these levers protrudes sidewise a pin ending with a shackle. to which the return spring is hooked on. The other end of the spring is hooked on to the upper plate of reference and guide of the keystems (fig. 43).

This pin operates vertically according to the run of the entering key on the slanting portion of the slot cut in the sliders placed right and left of the supporting side plates.

The left slider 8215 E serves the purpose to actuate with its front connecting stud also the right slider K 8214 E.

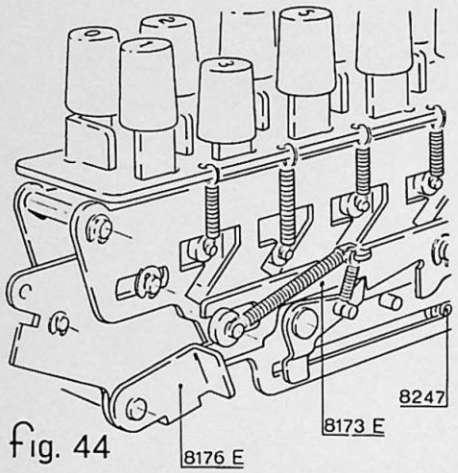

fig. 44

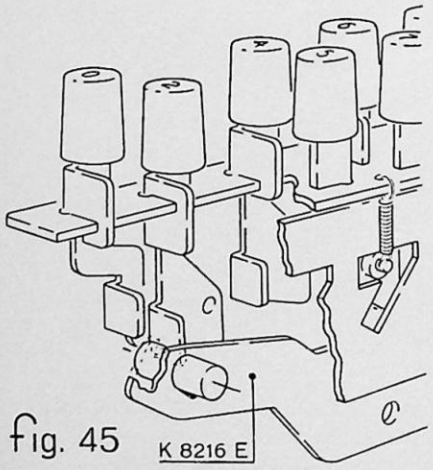

fig. 45

The sliders, when moved by the depressing of any key, will actuate the locking of the remaining 9 keys by means of the teeth appearing in the guiding slots where the keystems run (fig. 44). The right slider K 8213 E carries the pawl lever system suitable for the disengagement of the releasing and returning bridge 8176 E, namely the small releasing slider 8173 E and the disengagement returning pawl articulated on the K 8214 E and actuated by guiding stu 8247 for rack K 8216 E (fig. 44).

The keys for the entry of the multiplier units are placed on two lines. The left keys carry digits 0 2 4 6 8, the right ones, digits 1 3 5 7 9.

The action of keys 1 2 3 4 5 6 7 8 9 is identical, but for the difference in the number of steps producing the stop of the bilateral stud of the rack, according to the value of the units of the key depressed. The zero key having a function similar to the other keys must pre-set the machine for an operative cycle in NON-ADD and have the action of the counter cancelled.

The levers of the multiplier keys have two right angle bends. When a key is depressed, the upper bend enters into the file of the balls, which are contained below in cage 8181 E.

These balls in the cage have such a play as to allow only one thickness of material to enter into their file and prevent thus another key from sinking until the key previously depressed has not been restored.

The action of a depressed key lever is as follows:

a) Shifting of the sliders by means of the key lever stud on the slanting plane underneath

b) Releasing of bridge 8176 E by means of spring 8205 at the end of the slider run. This occurs because there is no longer a contrast of the relesing plane of slider 8173 E against the right angle bend. of the releasing bridge. This bend rotates upwards and leans against the front end of the right slider holding it in the shifted position. In its motion, bridge 8176 E pushes upwards with its upper profile the stud and also pawl K 8171 E, which releases the trip of rack K 8216 E.

This rack springs backwards due to the action of the two springs 8284 until its bilateral stud stops against the lower bend of the key lever actuated (fig. 45).

When we restore rack K 8216 E, towards the end of its rim and before hooking on to pawl K 8171.E, its front slant hits the round bend of bridge K 8176 E gliding on it and rotating the bridge until the right angle bend of same has released the right slider, which thus can spring

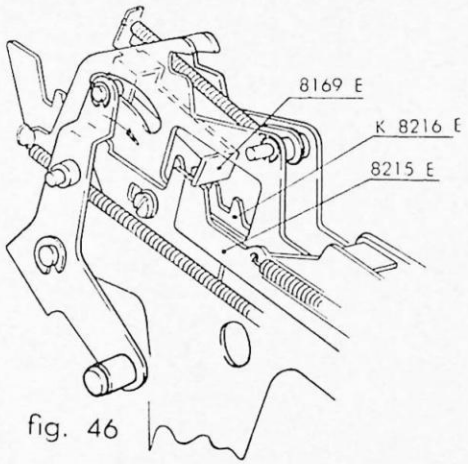

fig. 46

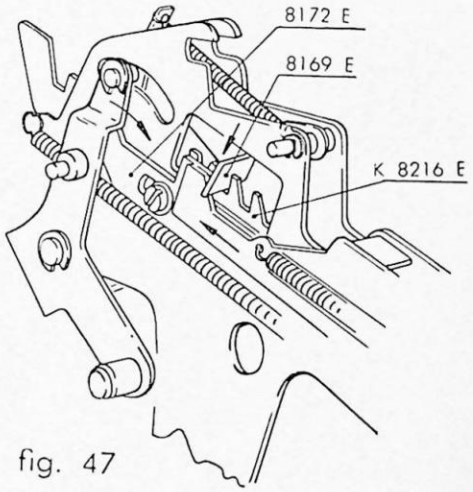

fig. 47

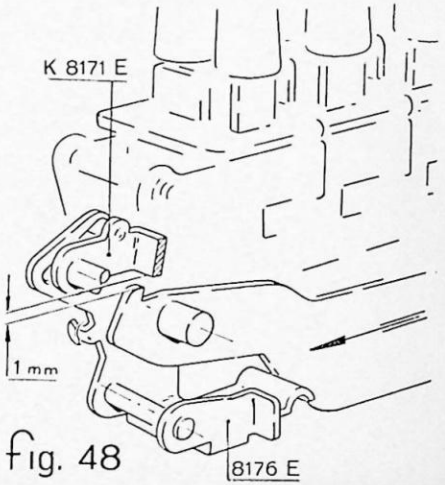

fig. 48

back to its resting position under the action of springs 8188. At the same time, the key depressed is released and returned by means of its spring 8283 (as in fig. 42).

Should the depressed key be kept down, the rack still actuates the return of bridge 8176 E and by means of its stud 8247 it acts upon the pawl of K 8214 E and rotates it, thereby releasing slider 8173 E, which returns upon the action of spring 8294 and places itself upon the right angle bend of bridge 8176 E preventing the rack from being successively actuated. The operator is thus compelled to release the key and allow slider K 8214 E to return for the engagement of the pawl with the tooth of slider 8173 E.

This is a safety for the exact counting of the cycles even when the multiplication keys would be kept down longer than the necessary number of cycles.

The left slider 8217 E has a slant on its back end, which prevents, when no key is depressed, the rack returning tooth 8169 E from operating (fig. 46).

When the slider is in back position (a key is depressed) it frees the space concerned of the action of returning tooth 8169 E, which can glide on the adjustable profile 8172 E and hook on the tooth of the rack to be returned in the succession of the machine cycles (fig. 47).

Returning tooth 8169 E is assembled on a bridge receiving a reciprocal motion from its own eccentric roller controlled by cam K 8168 E, which is adjustable on the main shaft assembly K 8151 EF of the machine.

Pivoted on the side plate K 8226 E there is a bridge K 8280 E which has an upper end tail. This tail serves the purpose of stopping the printing and paper feeding of the machine after the first operational cycle of the multiplication for the printing of the multiplicand.

At the back of the right side plate K 8227 E and pivoted on it there is disengagement lever 8282 E which operates by means of its upper bend to disengage returning tooth 8169 E at the end of each cycle of the machine under the action of the roller of cam 8168 E.

This is to make rack K 8216 E free for the successive disengagements.

Check that in the return phase (final step) of the rack its slant (serving to the rotation of bridge 8176 E) allows the trip to pass clear off the action of pawl K 8171 E, before this lowers in its returning action. Said clearance should be 1 mm in value (fig. 48).

2) **Counting device of the multiplier.** This device enables the machine to store in a series of proper pinion gears the value of the multiplier selected by the cycles automatic computing device.

This device consists of a frame K 8053 E hinged underneath the calculating sectors on shaft 8291 E and fixed on the bottom cross piece.

Pivoted on this device there is a bridge with two positions depending upon the shifting of two cam arms B 8070 E. (On the support is assembled a locator with leaf springs, which locates in

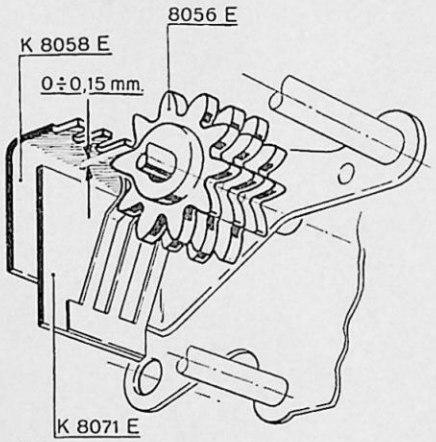

fig. 49

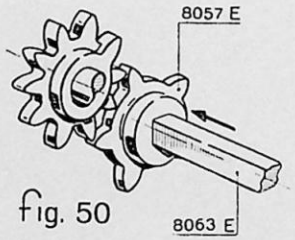

fig. 50

the in-phase position (fig. 49) pinion gears 8056 E of the counter. Said pinion gears carry a lateral catch.

When thes winging support is controlled for meshing in with the sectors of the machine — and the pinion gears are in zero position — the catch should lean against the rack of frame K 8058 E (fig. 49) or at maximum have a clearance of 0.15 mm.

In this model of machine, part of the calculating sectors have been modified by adding special teeth in the lower part towards the base of the machine.

It is precisely with these teeth that the pinion gears of the multiplier should mesh in when the machine clears (i.e. when a Total or Sub-Total is trown off) after the operation of multiplication, in order to achieve the printing of the numerical value of the multiplier after the multiplicand. Assembled on the lower part of frame K 8058 E we have the square section shaft 8063 E carrying on left a locating pinion 8059 E, a counting bridge K 8078 E and inside of the frame a counting pinion 8057 E with 5 teeth, which glides on the shaft as it is being drawn by a box K 8072 E, guided crosswise in its turn, by shaft 8064 E.

Said counting pinion with 5 teeth is assembled in phase with respect to the pinion teeth of the multiplier, so that it glides freely crosswise (fig. 50).

The pinion-carrying box K 8072 E is equipped in its lower part with teeth suitable for its column shifting and localization for the computing positions.

This box is drawn to the right by a spring B 127.

The counting bridge K 8078 E carries a hook 8082 E that can be engaged or not under the action of the controlling stud, which is connected to the left cam of the controlling central shaft of the machine K 8151 EF. This hook will be engaged every time the multiplication keyboard is operated.

The engagement control is operated by the elastic bridge K 8134 E, which is actuated by the release of the motor starting bridge K 8138 E of the machine.

The hook of the counting bridge K 8078 E is drawn by the controlling stud of part K 8151 EF and moves forward hooking on by means of pallet 8083 E the following tooth of the locating pinion 8059 E. In the machine return cycle, spring 8286 will have rotated of one step — by means of its pallet 8083 E — pinion 8059 E, located in its turn by the bridge roller K 8079 E.

The locating pinion is fixedly connected through its square hole to counting shaft 8063 E which at each step moves of one tooth counting pinion 8057 E and this, in its turn, moves one pinion of the multiplier.

Any number of cycles of the machine corresponds to the same number of actuated teeth of the multiplier pinion. In this way the storage of the numerical value of the multiplier is performed. The action of the counter takes place when bridge K 8071 E is actuated by cams K 8070 E downwards.

On shafts 8062 E and 8061 E is assembled bridge 8081 E which checks, in the clearing of the multiplier value, the machine sectors when they should exceed the multiplier capacity.

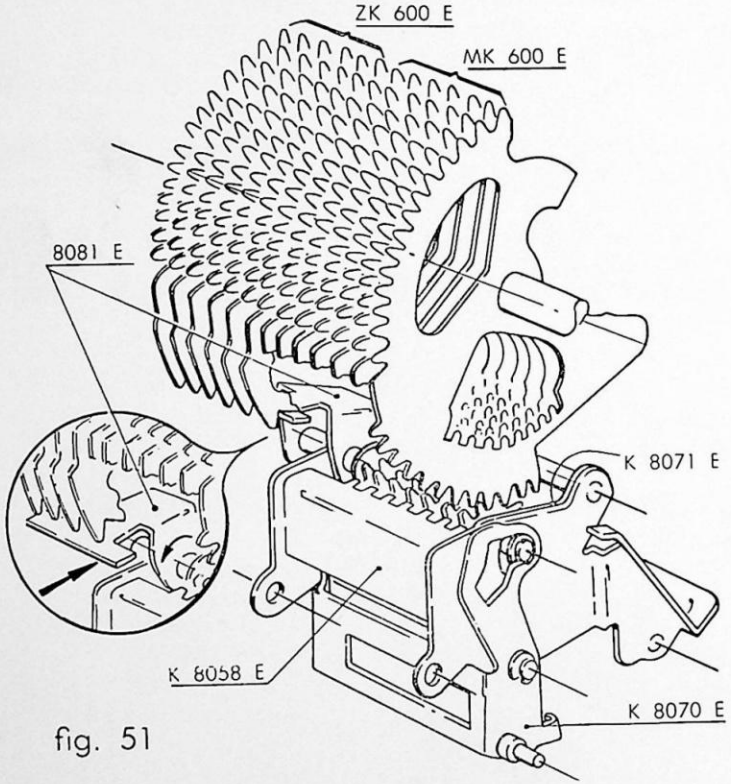
ZK 600 E
MK 600 E
8081 E
K 8071 E
K 8058 E
K 8070 E

fig. 51

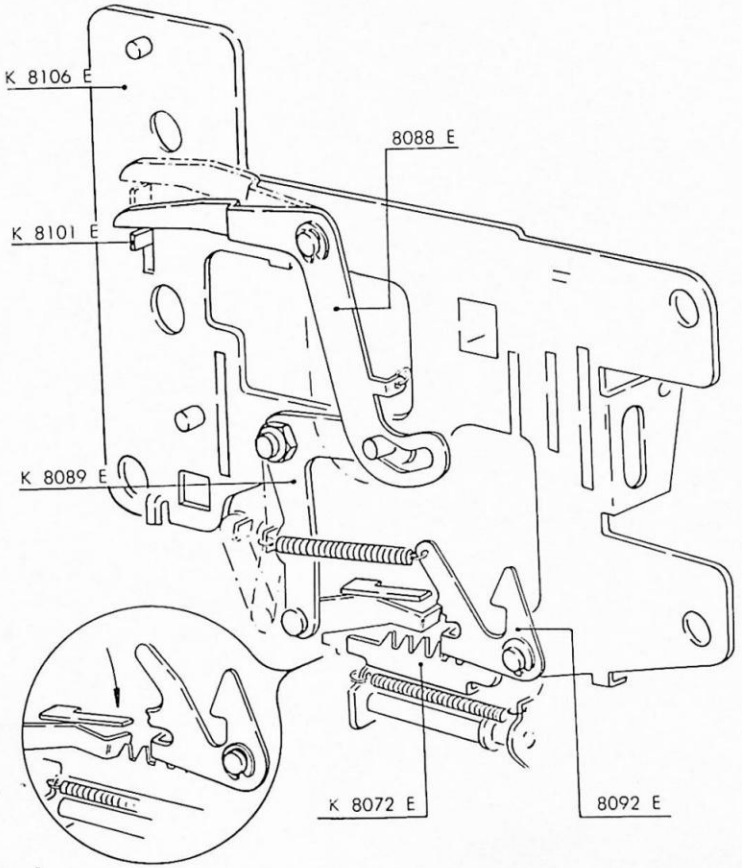
K 8106 E
8088 E
K 8101 E
K 8089 E
K 8072 E
8092 E

fig. 52

In fact the machine calculating sectors MK 600 E, i.e. the first 7 on the right, have lower teeth, whereas the remaining 6 sectors on the left ZK 600 E have no teeth, but a protrusion which serves precisely for the contrast with bridge 8081 E (fig. 51).

It can therefore be said that the maximum operational capacity with the multiplication keyboard is of 6 digist in the multiplicand and 7 in the multiplier with a maximum total balance of 13 digits.

3) **Column automatic step-over device for multiplicand and multiplier.** A supporting plate K 8106, rigidly assembled on the bottom plate by its lower part, carries the motion transmission mechanism for column shifting.

The control of said motion transmission mechanism is performed by means of the tail of slider K 8101 already known and proper to the machine models 8341 - 8441 (fig. 52).

At every final cycle for the computing of the multiplicand units the key is restored and therefore slider K 8101 E is released which so pre-sets with its lower tail cam lever 8088 E. This rotates and actuates the lever with hook K 8089 E that drags box K 8072 E carrying counting pinion 8057 E.

At the end of the cycle, in the last 15°, slider K 8101 E is returned by lever ZK 35040 EF and bridge lever Z 35049 E and pushes cam 8088 E, rotating it.

Lever K 8089 E is also returned, which, by means of its hook, drags box K 8072 E by the lower teeth and shifts it one column to the left to locate in the new position set by hook 8092 E.

The counting pinion 8057 E is thus ready to compute the successive pinion of the multiplier and so forth every time a multiplication key is depressed and returned.

The column shifting device operates on the contrary as in the other models of machine with its ratchet WK 35056 E on the zero step-over linkage ZK 35050 for a step to the left of the stop carriage.

In such a way, the automatic shifting of both the stop carriage and the counting box of the multiplier is obtained.

4) **Connection and starting functions of the machine and 2 clearing cycles.** It has already been seen how by depressing a multiplication key, rack K 8216 E can spring until it stops in connection with the key itself (fig. 45). By this motion, releasing bridge K 8230 E, which leans against the slant of the rack by means of its roller, can operate under the action of spring 8293.

The cam profile of the releasing bridge K 8230 E controls bridge K 8201 E, which, is its turn, rotates the cross linking K 8138 E. The linking rod 8212 E acts upon ratchet K 8211 E pivoted on shaft 8291 E placed on the right side of the machine.

Thus hook Z 3 E disengages and by releasing starting slider MK 305 E produces the start of the machine cycle.

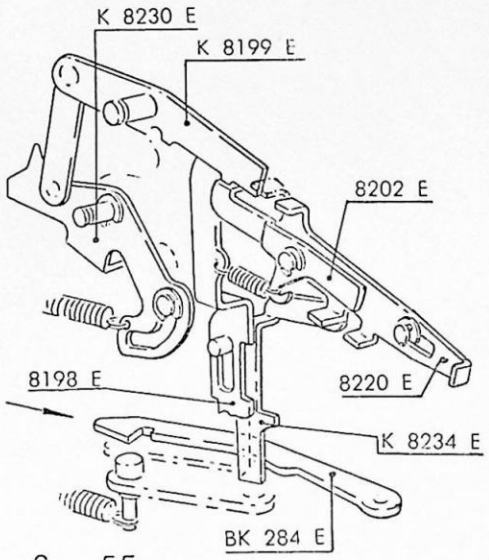

fig. 55

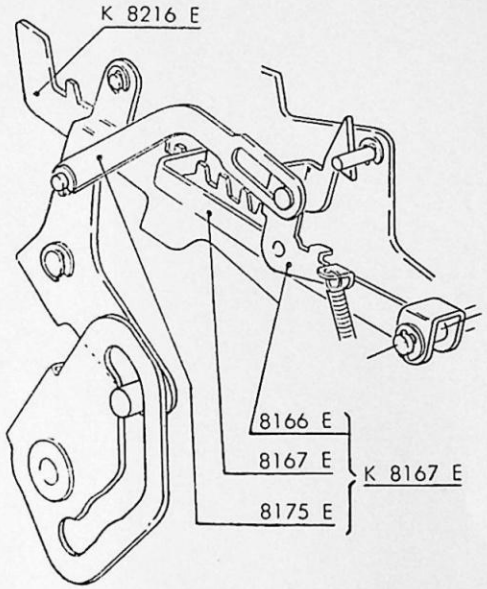

fig. 56

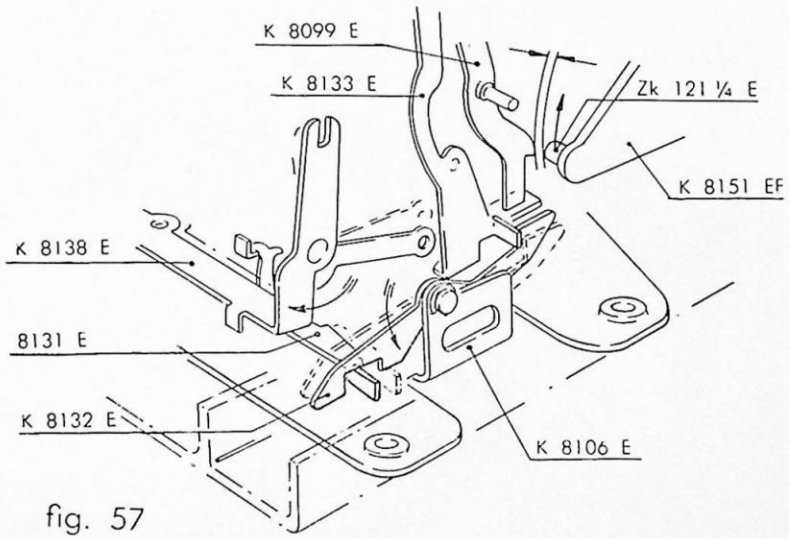

fig. 57

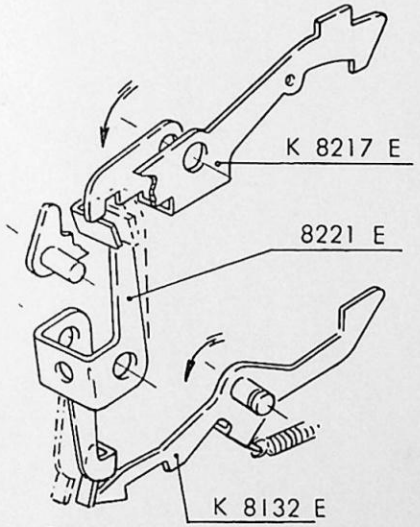

fig. 58

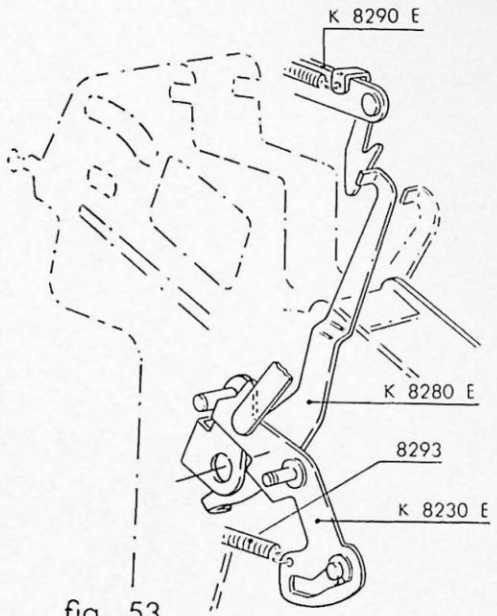

fig. 53

fig. 54

In its turn, releasing bridge K 8138 E, by means of its right fork and releases lock BK 1559 E, which holds back sign lever 8228 E and pre-sets the stop of sign " X " for its printing.

With its profiled back end, disengagement bridge K 8230 E actuates the stud of locking K 8280 E and brings the upper end of said locking under the action of bridges B 3395 E and K 8290 E (fig. 53) which in the following cycle lock, respectively, the feeding of the paper and the printing (fig. 54).

The same releasing bridge K 8230 E, which is linked to the swinging lever K 8199 E in its motion, lowers lever 8198 E for the pre-setting of the automatic column shifting. On account of this motion, a point of contrast is obtained for the excess capacity 8220 E, which cannot advance, as it is left free by pallet 8202 E.

By lowering, lever K 8199 E draws lever K 8234 E. This, in its turn, by pushing away hook BK 284 E prevents the stop carriage from being restored to zero (fig. 55).

Upon its release, the rack makes free with its back end the hook system K 8167 E causing the stop bend of arm 8167 E to fall into the teeth of the rack to locate it step by step (fig. 56).

After restoring to zero, as it is returned by arm K 8170 E and hook 8169 E, the rack looses itself from hook K 8167 E by its back end profile and makes ratchet 8166 E hook on to the stud of the supporting side plate.

Ratchet 8166 E has a reciprocating release motion actuated by connecting rod 8175 E, which is always ready to perform said motion, should the rack be released.

The depressing of a multiplication key produces successively the swinging of the disengagement bridge K 8138 E. Together with its arm 8131 E shifts and frees hook K 8132 E assembled on supporting plate K 8106 E. This falls, engaging with the arm itself, whereas by means of its back tooth it hooks on the lug of swinging piece K 8135 E. By this motion, the control of the three automatic cycles has been achieved, namely the restoring of the fallen tens transfers, the discharge of the multiplier and of the balance (fig. 57).

When lowering, hook K 8132 E operates by means of its front profile the lug of lock 8221 E, which carries on its upper part a bend that shifts, placing itself under the arm of pallet K 8217 E. After depressing a multiplication key, we have therefore the locking of the " Non-Add ", " — ", " R " and " + " (fig. 58).

The particular task of multiplication key " O " is to pre-set the control of the NON-ADD of the machine by means of the connecting rod and the adjustable arm K 8197 E. Linked with and adjusted by this arm, there is a shaft with cam K 8223 E, which transfers the motion from the left to the right by actuating bridge K 8225 E carrying a rod with a shaped lever K 8229 E. By

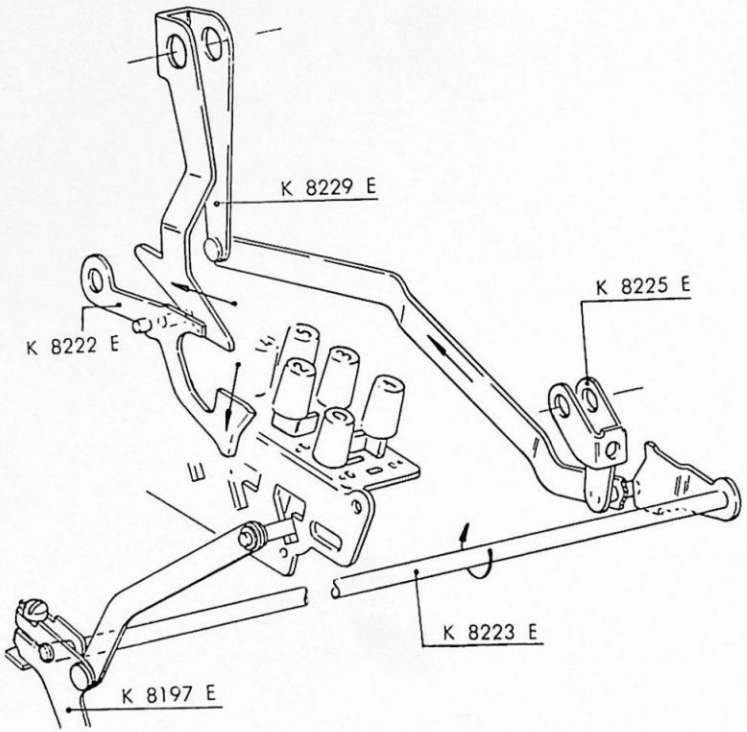

fig. 59

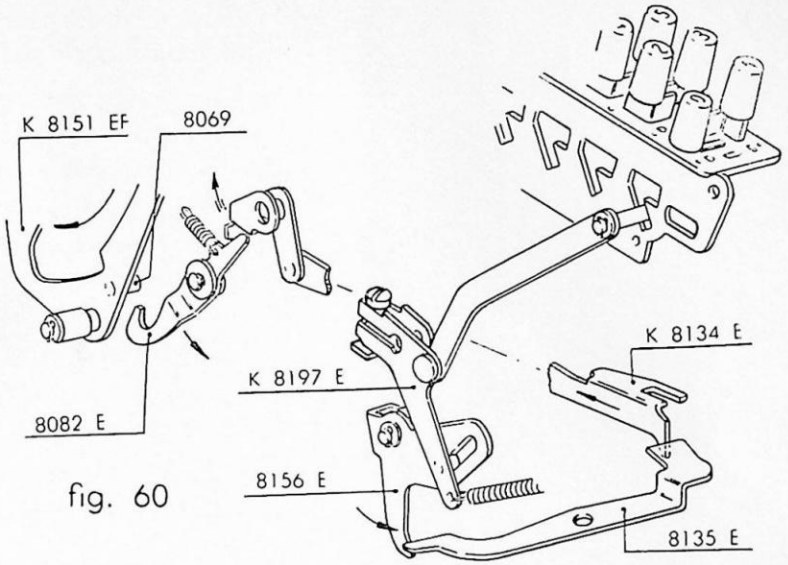

fig. 60

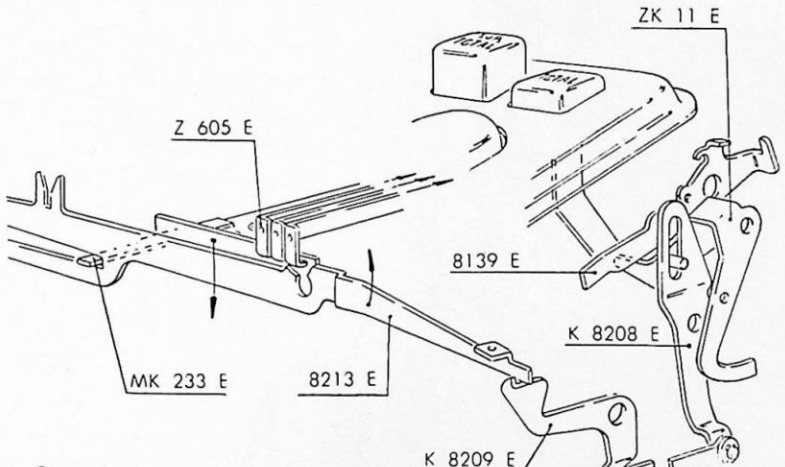

fig. 63

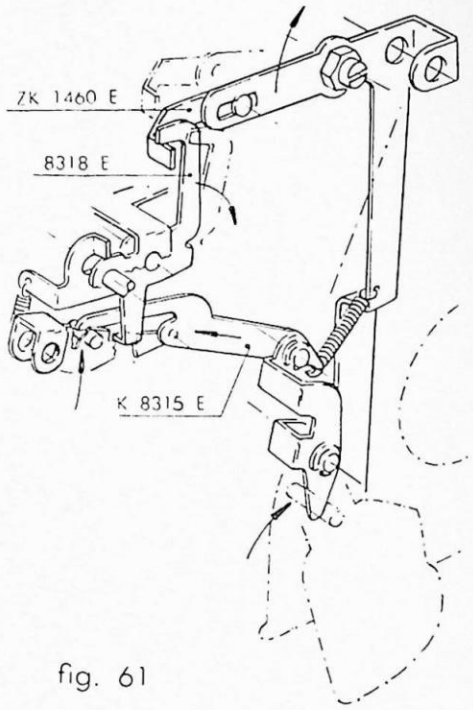

fig. 61

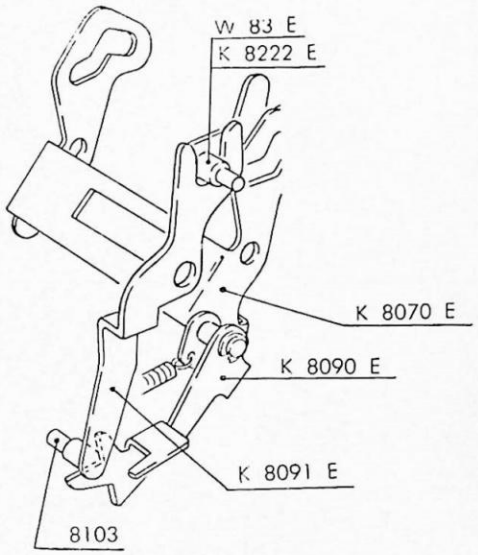

fig. 62

moving, the shaped lever acts on the latch hook K 8222 E and disengages it from the stud controlling the meshing in of the totalizer with the calculating sectors (fig. 59).

In this motion, adjustable arm K 8197 E shifts with its lower stud cam bridge 8156 E. This, in its turn, operates swinging piece 8135 E and disengages elastic rod K 8134 E making free hook 8082 E, of counting bridge K 8078 E, from the action of stud 8069 on part K 8151 EF of the machine main shaft. Therefore, counting pinion 8057 E remains in resting position (fig. 60).

After an operation of multiplication made by using the special keyboard, the balance key should be depressed. The engaging bridge 8139 E operates the disengagement of hooks B 178 E, which act on bridge K 8104 E.

In its turn, this should draw bridge 8116 E with which it is elastically connected by spring 8321 E.

Bridge 8116 E is connected with the swinging piece K 8133 E, which, however, is checked in it motion by the stop actuated by hook K 8132 E.

The swinging piece K 8133 E has a slot, in which rod K 8099 E is guided, so that it is hindered in its motion and does not receive control of the stud ZK 121, ¼ E of the main shaft K 8151 EF (fig. 57).

In this way, we have the first idle cycle of the machine for the return of the tens transfers that might have fallen on account of the calculation locking taking place through hook 8318 E, which hinders the unlocking action of lever ZK 1460 and therefore leaves bridge ZK 3254 E in locked position.

At the end of the machine cycle, in the last 20°, hook 8318 E is made free by the motion of the rod, with elastic pallet K 8315 E (fig. 61).

At the same time, latch K 8222 E moves forward and, with its stud W 83 E engaged in the fork lever K 8091 E, it swings same. Said lever carries on its lower end stud 8194 which controls engaging hook 8090 E assembled on cam K 8070 E (fig. 62).

Cam K 8070 E rotates and engages bridge K 8071 E and therefore calculating sectors.

The depressing of the total key, and therefore the motion of the disengagement bridge 8139 E, operates hook ZK 11 E, which, by means of its stud, acts on the slot of cam K 8208 E.

This shift lever K 8209 E, which acts on the front cross piece 8213 E by means of its forward arm.

In this way, the escape bracket of the stop carriage MK 233 E is lowered and thus the tie rods Z 605 E of the calculating sectors are free to operate (fig. 63).

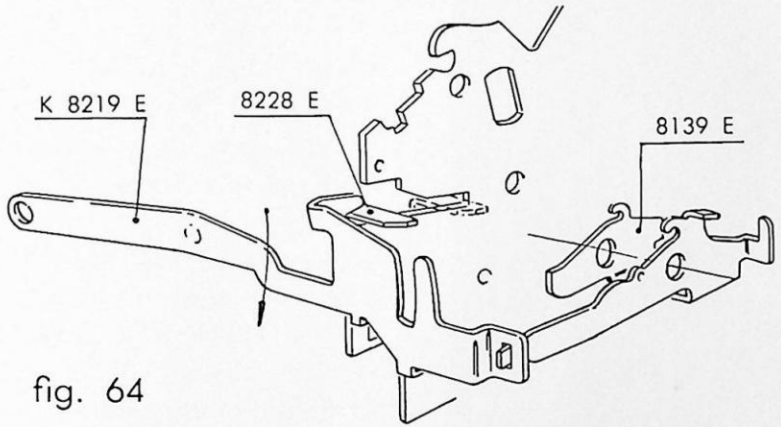

fig. 64

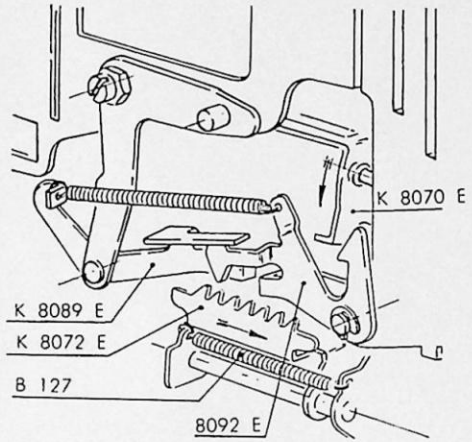

fig. 65

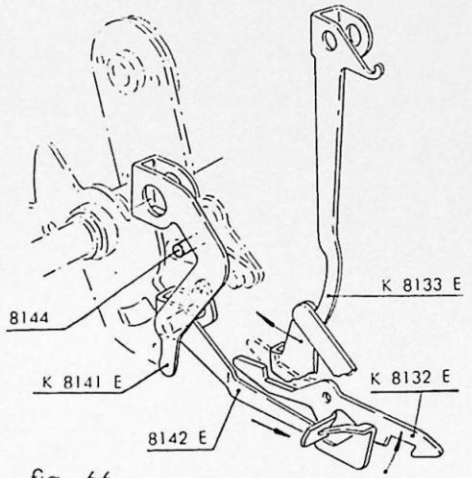

fig. 66

At the beginning of his second cycle, the following movemens have taken place:

1) Unlocking of the calculating system

2) Meshing in of the multiplier pinions with the calculating sectors

3) Unlocking of the calculating sectors

4) Lowering of the sign lever by means of the cross lever K 8219 E for the printing of the " = " sign.

The printing is operated by means of the stop of the sign lever on the bottom of the slot in the right frame plate, because in this there is no movement of any intermediate stop (fig. 64).

After the first 20° of this machine cycle, the calculating sectors, being free to rotate, read on pinions 8056 E the value of the multiplier, so that they restore to zero the pinions themselves until their returning tooth stops against the catch bridge square piece of frame K 8058 E. Now the printing takes place and the return phase begins with the rearward motion of latch K 8222 E. The fork lever K 8091 E returns and rotates, under the action of spring 10300, cam K 8070 E, which brings again downwards the multiplier pinion bridge K 8071 E.

The multiplier is thus again to zero.

In the operation of the multiplication just performed, box K 8072 E carrying the counting pinion 8057 E will have shifted to the left for as many steps as the digits o fthe multiplier. When cam K 8070 E is rotating, its tail (fig. 65) has rotated hook 8092 E, which has freed the locating teeth of the counter carrying box K 8072 E. Drawn by its spring B 127, the box therefore immediately returns to the right and is ready for a successive operation.

At the end of the first machine cycle, ratchet pawl K 8132 E releases swinging part K 8133 E, as it is controlled by the returning link piece 8142 E, moved by arm K 8141 E. This receives the continuous swinging motion from stud 8144 of cam 8144 E assembled on the machine main shaft K 8151 EF (fig. 66).

The swinging part K 8133 E thus released springs backwards to engage rod K 8099 E under the action of stud Zk 121, ¼ E of the machine main shaft. In the last 20° of this second machine cycle, the rotation of part BK 263 E is prepared for the normal balance, which in this case is the product of the multiplication. Ratchet pawls 8090 E and 8142 E are released in the two automatic cycles described, for their successive functions, by the upward shooting of the balance bridge K 8104 E, which in its lower end has 2 studs for this purpose. This in the described phase of the two cycles.

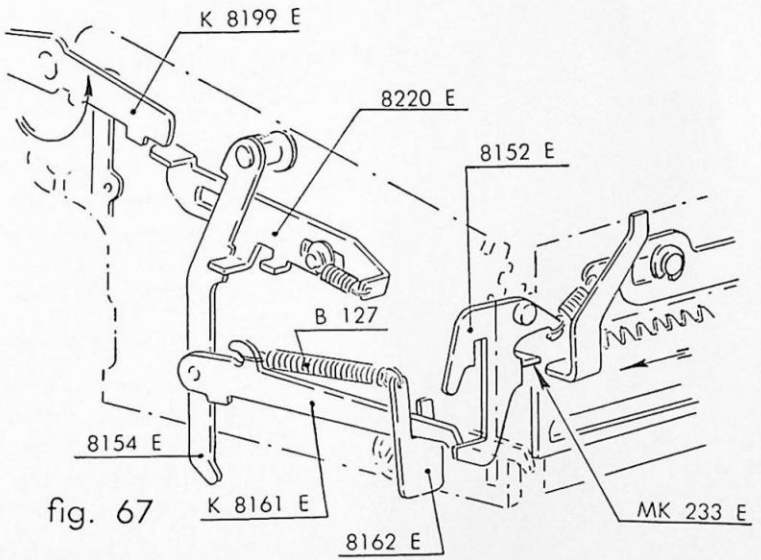

fig. 67

5) **Locking and safety devices against excess in capacity.** As already mentioned, the maximum capacity of product is a number of 13 digits. This can be obtained either with a capacity of 6 digits in the multiplicand and 7 digits in the multiplier:

Ex.

```
      211.111 ×
    9.111.111 =
-----------------
1.923.455.754.321 T
```

or with a multiplicand of 7 digits and multiplier of 6 digits

Ex.

```
    2.111.111 ×
      911.111 =
-----------------
1.923.456.454.321 T
```

or with a multiplicand of 12 digits and multiplier of 1 digit

Ex.

```
211.111.111.111 ×
                9 =
-------------------
1.899.999.999.999 T
```

To obtain a safety of result, which does not allow the operator to perform wrong operations, due to having exceeded capacity by oversight, the machine has been equipped with special locking devices. When we actuate the stop carriage to its maximum capacity, its tail protruding from the front keyboard plate moves in the run to the left of the 12th entering step the swinging piece 8152 E and brings the lower lug of same on the path of ratchet K 8161 E.

This ratchet is assembled on and is moved by its lever, which receives a thrust at every cycle of the machine from the arm BK 282 E.

Ratchet K 8161 E on its returning run (guided in the slot of support 8162 E and returned by spring B 127) leans against tail 8152 E. Now lever 8154 E of the K 8161 E also controls the locking slider 8220 E which, as it is no longer returned, places itself under the front tail of part K 8199 E and does not allow any longer the successive disengagement of the multiplier key that might be depressed (fig. 67).

The machine does not start and the operator is compelled to depress the key of the balance, thus obtainig printing of the exact factors and product.

In the other two cases, where there is an excess of capacity of the multiplier, the locking control is actuated by the counter box K 8072 E, which has a lower tail.

In the last column shifting to the left, from the sixth to the seventh position, said tail moves the nose of lever 8096 E, adjusted on cam lever 8095 E, which by moving displaces the rocker lever K 8094 E. In the slot of said rocker lever is located the lower tail of arm 8158 E which by

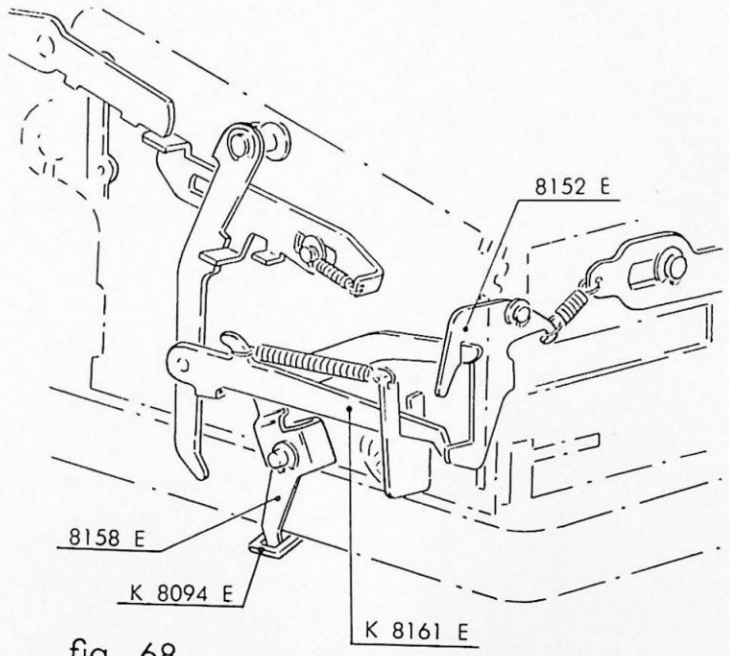

fig. 68

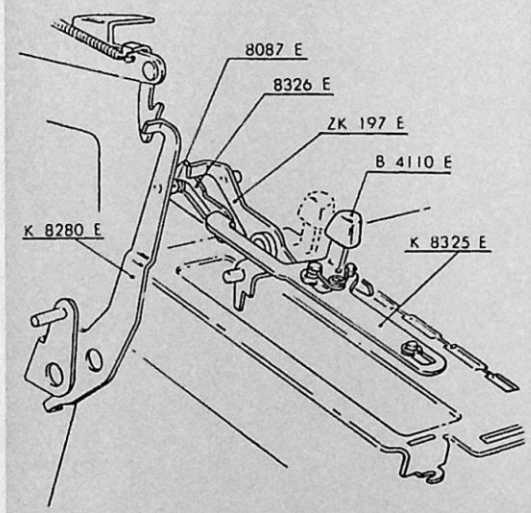

fig. 69

lowering shifts swinging part 8152 E. This, in its turn, goes with its lower tail on the path of locking ratchet K 8161 E of the machine.

In the successive cycle the machine does not start and we have therefore the same condition of safety as already described (fig. 68).

The operator is compelled to depress the key of the balance, obtaining the printing of the exact factors and product.

By product of the multiplication is meant a partial or a total balance.

On the keyboard plate 8235 E, on the upper left and beside the multiplication keyboard there is key B 4110 E with two postions: one showing upwards for the operation in positive and the other showing downwards in correspondence with the red sign for the operation in negative. By pulling this key downwards, slider K 8325 E is moved. This has on its back part a movable ratchet 8326 E. Upon disengagement, after having depressed the multiplication key, the bridge K 8280 E releases.

On this is assembled a stud 8087 E, which, by gliding in the slot of ratchet 8326 E, lifts it, causing it to actuate the subtraction bridge ZK 197 E (fig. 69). The machine thus operates with negative cycles, giving therefore negative products.

MAINTENANCE AND ADJUSTMENTS FOR MULTIPLICATION KEYBOARD

Adjustment of the column shifting of the multiplier

Loosen screw 1003 which locks eccentric 8097, displace counter carrying box K 8072 E on an intermediate column (e. g. 3 ÷ 4), make sure that ratchet K 8089 E is hooked on to the rack tooth of said box, then by moving eccentric 8097 align counting pinion 8057 E with pinion 8056 E concerned of the totalizer multiplier series. Lock again completely screw 1003 of the eccentric.

Adjustment against excess of capacity of the multiplier

Bring the counter carrying box K 8072 E on the last column to the left, loosen screw 1003 locking levers 8096 E and 8095 E. Move this last cam lever in such a way that arm 8158 E with its end goes well into and on the bottom of the slot of swinging part 8152 E and maintaining it so rotated and pre-set for the safety function against the excess in capacity of the multiplier. Lock again completely screw 1003 of levers 8095 E and 8096 E.